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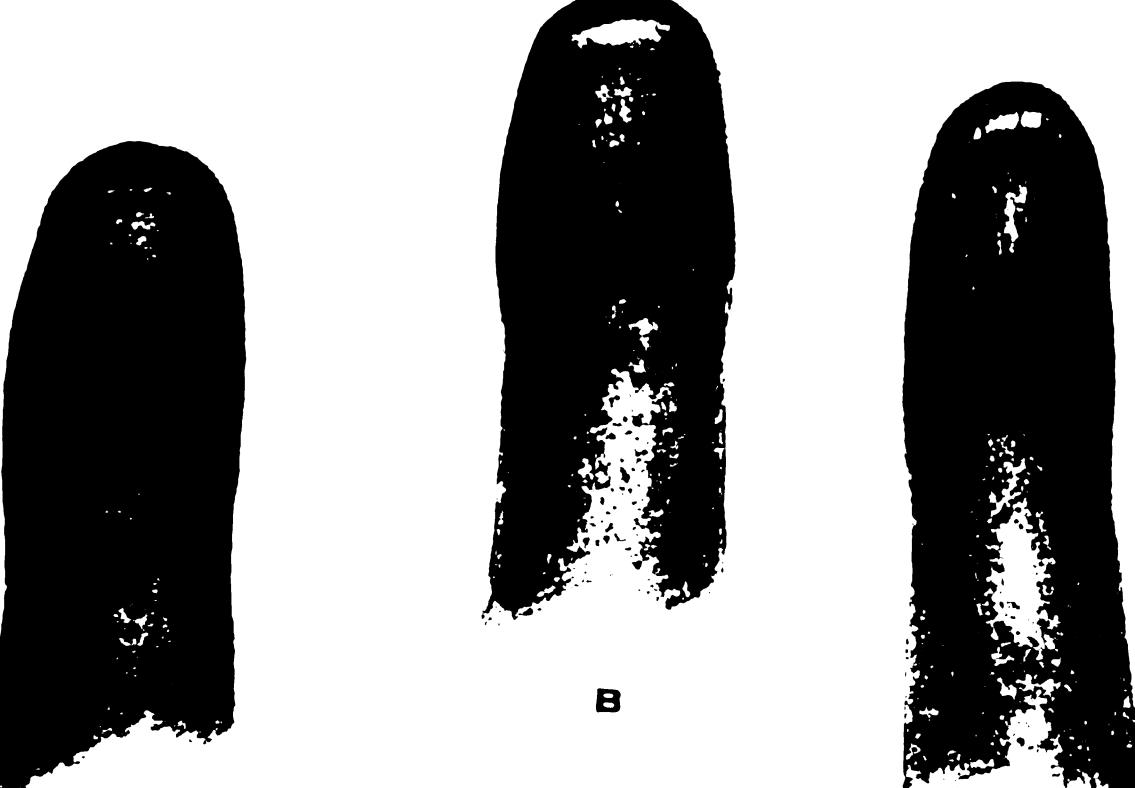
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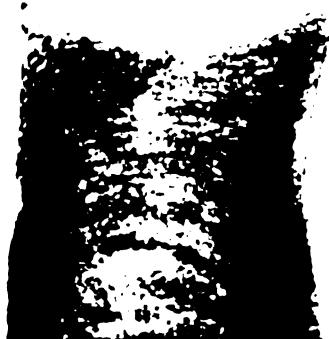
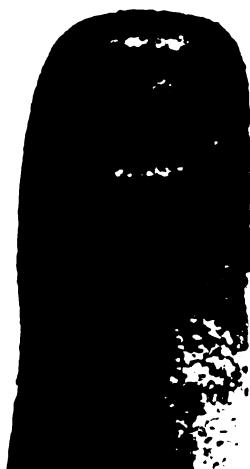
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PLATE I.



A, hand showing paroxysmal acro-asphyxia with black band on nail; *B*, hand elevated showing change of color with gravitational emptying of congealed vessels.

(Page 49.)

INTERNATIONAL CLINICS

A QUARTERLY OF ILLUSTRATED CLINICAL LECTURES AND ESPECIALLY PREPARED ORIGINAL ARTICLES ON TREATMENT, MEDICINE, SURGERY, NEUROLOGY, PÆDIAT- RICS, OBSTETRICS, GYNÆCOLOGY, ORTHOPÆDICS, PATHOLOGY, DERMATOLOGY, OPHTHALMOLOGY, OTOLOGY, RHINOLOGY, LARYNGOLOGY, HYGIENE, AND OTHER TOPICS OF INTEREST TO STUDENTS AND PRACTITIONERS

BY LEADING MEMBERS OF THE MEDICAL PROFESSION
THROUGHOUT THE WORLD

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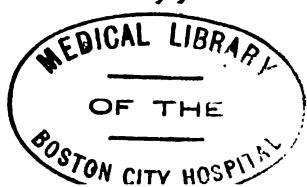
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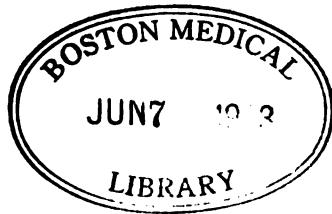
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Treatment

TREATMENT OF TUBERCULOSIS *

BY A. P. FRANCINE, A.M., M.D.

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I HAVE seen during the past ten years certain pronounced and characteristic developments in medical thought and teaching, two of which are more apparent and possibly far-reaching than the others. One is the great advance made in the science of preventive medicine, the practical working out and adoption of the policy that the prevention of disease is of equal importance with the treatment of disease; and the second, the development of saner views in the use and prescription of drugs and the recognition of the really subordinate place they must often take in modern therapeutic measures. In no one disease or phase of medicine are these two tendencies more readily seen than in relation to tuberculosis. With the first, for the purposes of this paper, we have nothing to do, but with the second we are very directly concerned.

While there is increasingly bright promise that slowly but surely one after another of the infections will be added to the list of diseases for which we shall have a strictly specific therapy, yet so far, tuberculosis is not among these, except inasmuch as tuberculin may be considered such; and in common with the great majority of diseases we have come to place reliance on careful supervision and nursing, on the medical hygiene of the case, and to consider drugs of distinctly secondary importance. Further, we have learned how to employ the drugs at our command with, generally speaking, greater moderation and skill than our forefathers;

* Address at the annual meeting of the North Pennsylvania Clinical Society, Lansdale, Pa., June 16, 1909.

and, more important even than this, we have learned, or should learn, when not to employ them.

It is impracticable to lay down rules to be blindly followed in the treatment of disease, because medicine is not an exact science and each case must be treated individually within certain broad limitations. It should always be borne in mind that we are not treating the disease, but the patient as that disease affects him; and the details of treatment, certainly outside the walls of medical institutions, must, in the last analysis, be largely left to the judgment and experience of the individual physician. Emergencies must be met as they arise and cannot properly be anticipated didactically, so that in medicine the personal equation, *i.e.*, the skill, experience, and character of the handcraftsman, is an important factor and is on trial in every case he sees.

Therefore, upon an occasion like the present, I feel that, so far as may be, we should consider the broader principles involved in the treatment of tuberculosis rather than specific details, however important they may be, for with the former as a sure foundation, the judgment and resourcefulness of the physician can generally be trusted. And yet, that the principles involved, widely as this subject has been exploited, are not yet generally understood, I have daily proof; and it was for this reason that I gladly accepted the kind honor of addressing you on this subject, hackneyed as it may at first appear.

In order to emphasize better the point I would make, I am going to ask you the following questions:

Of what possible benefit can it be in consumption to give strong cough medicines or those containing opium (which I am ready to admit may, to a certain extent, at least, control the phenomenon of cough), so long as the process in the lung, the cause of the cough, goes steadily on?

Aside from the necessary ill effect upon digestion, which is to be so zealously guarded against, no one with any scientific knowledge or attitude of mind would claim that cough mixtures had any effect except an unfavorable one upon the process in the lung. What is the use of attempting to control (for it cannot be done in this way) a symptom, so long as the direct cause of it goes unchallenged? It is like applying a cosmetic to a coated tongue when

the trouble is at the other end of the line. If you will pardon my speaking personally, because I am deeply interested, I would like to say that in the very large number of these cases which I see every month, particularly from my hospital connections, I do not prescribe ammonium chloride or codeine or terpin hydrate five times in a month.

What is the use of giving atropine or other drugs in an attempt to control night sweats when you permit the cause of the symptom steadily to progress? One might as reasonably apply a hair tonic to relieve the alopecia caused by syphilis. I cannot recall that in the past year I have ever prescribed a drug for night sweats.

What is the use of giving stomachics, carminatives, or gastric sedatives in a case with irritable stomach and inability to take or retain food, so long as the patient is going about with a temperature of 102°, and the toxicity which that implies?

I could run through the whole gamut of symptoms, telling the same story in regard to each. In tuberculosis we do not give drugs to control symptoms: first, because it is amazingly futile; second, because it is grossly illogical; and third, because it is entirely unnecessary.

In the tuberculosis wards of the Philadelphia Hospital we have principally advanced cases, many of them beyond the hope of recovery, but one hears very little coughing, finds very few cases with night sweats, and, except in the dying cases, the patients appear surprisingly comfortable, as indeed they are. This is not in any sense peculiar to these wards. Go to the wards of any well-managed tuberculosis hospital or infirmary and the same is true. Why?

Before I answer that question, though I fancy you have already done so, let me say that I have presented this subject in this way because there is not a week passes that I do not see this kind of thing being done by physicians of large general experience. I am going to take the liberty of recounting just one instance of this which occurred recently, because it is so much to the point. A physician, who has been in practice thirty years, brought a young man with advanced pulmonary tuberculosis to me for admission to the State Sanatorium at Mt. Alto. After I had examined him and listed him for the Infirmary there, his doctor asked him to step

into the waiting room and then he said to me, "I'll tell you what I've been doing for him. I've been giving him Blaud's pills three times a day for his anæmia; and ammonium chloride every three hours for his cough; and at bedtime he gets $1/100$ grain of atropine for his night sweats. But he doesn't seem to be improving, in fact, he is going down hill very rapidly; would you keep the medicine up? Of course I make him get out into the open air. It's pretty hard work because he is so weak, but I insist upon his walking and being out as much as he can."

Gentlemen, I am not going to bother you with what I told that physician, but out of justice to both him and myself I will say that his parting words were, "Yes, I see, I see. I will stop all medicine and get him at once to bed."

Bed, let me say, is the word up to which I have been leading. You can do nothing with a case of active tuberculosis who has much fever until you put him at absolute rest, and the greater his fever or more marked his symptoms, the greater the necessity for it. So for fever, bed; for cough, bed; for night sweats, bed; for weakness and anæmia, bed; emaciation, bed; irritable stomach, bed; and so on through the whole list.

In other words, any case of tuberculosis which has a temperature consistently of 100° or above ought to have a complete rest cure; and cases with lower temperature, but with night sweats or other annoying symptoms, should be treated in the same way until their symptoms disappear; and it is perfectly remarkable how quickly patients respond to rest in bed. From looking over a number of charts of advanced cases, I can say that often in one week the temperature, from a range of 103° and 102° , will drop to 100° or below. Sometimes it takes longer, but the fact that it does take longer is the best argument for persisting in this course, as a patient whose symptoms you cannot reasonably control by rest in bed is going to die.

I have records of cases whom I have kept in bed for six months or longer and who I believe owed their subsequent recovery fundamentally to that one feature of treatment. I recall the case of a young woman who weighed ninety-five pounds when she came to my office four years ago with a large cavity in the right upper lobe and complete displacement of the heart to the right. She was so

toxic and weak that we had to support her on the scales. I kept that girl continuously in bed for nine months and began by letting her up for half an hour a day. To-day she weighs one hundred and thirty-five pounds, has no symptoms whatever, and is actively engaged in work again. Everyone engaged in tuberculosis work has had similar cases.

It is an axiom in tuberculosis that you cannot hurt patients by rest, but it is the easiest thing imaginable to exercise them into their graves. Of course, I believe in properly regulated exercise in suitable cases during convalescence, but that is a different matter.

To sum up in regard to rest, let me say that all patients with a temperature consistently rising above 100° should be absolutely confined to bed. If the temperature is between 99.2° and 100° the patient may be permitted to be dressed, but should rest most of the time on a lounge or cot. When the temperature is consistently not above 99.2° eight to ten hours should be spent in a reclining chair as long as active signs or symptoms remain. In each case he should, so far as possible, be in the open air, but protected from high winds or hot sun; and whenever in doubt, or whenever a patient is not doing well, put him to bed.

Exercise should be instituted only when the patient's temperature and pulse are normal or practically so, and should be slowly and systematically increased if he is not adversely affected by it. It is not, of course, the mere further gain of weight that is sought in the treatment during convalescence, for this in itself means nothing and patients who are permitted to get hog fat are by no means in the best condition. The aim should be to develop gradually the patient's resisting powers by suitably graded work and thus fit him for a life of reasonable activity and strain.

Of fresh air and life in the open I will say little because it is so generally understood and appreciated; but in this connection and apropos of what I have already said let me add, do not tell your patient in the acute stages of the disease to "be out" in the air if by following your advice he is going to walk, but tell him to "rest" in the fresh air, to get his bed or reclining chair into the open.

In regard to climate and altitude there are almost as many views as there are minds. For myself, I want my patients, after

they have reached a certain point in the cure, to go away, not with any idea that there is anything specific in the place to which they go, but because a change does us all good. That climate is, generally speaking, the best which permits the patient to spend the most time out of doors with the least discomfort. The really important point is that they should go somewhere where they can be under expert medical supervision during their convalescence. This I consider essential, and so, in sending cases away, I am influenced more by their means and their wishes, within the above limitations, than by any particular climate. I have seen cases recover right in the heart of the city. It is not the climate or altitude that cures them, though these may be factors, but the *ensemble*; the place where they are most contented and restful, where they can get the diet that suits them best and the fresh air that is the heritage of all; and just someone to go to, who knows enough to say "no" when they want to do something foolish, and who is just enough of a fool himself to inspire them with his own enthusiasm.

Finally a word as to diet. This is a subject that has been much discussed on clinical lines and which has been very carefully studied metabolically. Those who wish to know the conclusions reached in this latter manner should consult the work and writings of Dr. Herbert Maxon King. Dr. King is a recognized authority upon this subject and reduces the amount of food to be taken to what he considers a sufficient caloric value for patients of different types.

For most of us I think there is a happy medium between the views of Dr. King on the one hand and the extremists in forced feeding on the other, which should be dictated by common sense and by the social and medical features of the individual case. Personally, I seldom, if ever, give more than two quarts of milk and four eggs a day in addition to other food. But whatever amounts are being given, there should, of course, be a quick reduction at the first signs of intolerance on the part of the patient, whether exhibited in his gastro-intestinal system or in his general condition. I have seen cases which had previously been given excessive amounts of milk and eggs, with a steady loss in weight, begin to gain when the diet was reduced to more reasonable proportions. But I believe in milk and eggs, though not to the exclusion

of a more general diet and not to the amounts sometimes recommended.

The feeding of tuberculosis patients must, within certain limits, conform to the stage of the disease. In other words, there is not the same necessity in early favorable cases for increased diet, because they have less loss of weight to repair, they suffer with a less toxic process, and they can usually eat and digest three nutritious meals a day, so that in such cases a little milk drinking in addition to their ordinary diet is all that is required or even wise. A glass or two of good milk between breakfast and dinner, the same between dinner and supper, and again before retiring, will amply suffice. There is no objection, if the milk is taken slowly and properly, as it always should be, to drinking it also with meals.

But in more advanced cases the problem differs, because these cases have, as a rule, little appetite and cannot eat, and if we are to get them to take the increased nourishment they need it must be more assimilable than solid food; for here we have not only to overcome the daily catabolic waste of the disease, but by a heightened nutrition to repair the loss which has previously taken place. The principle involved is that of getting as much nutritive value out of the diet with as little strain on the gastro-intestinal tract as possible, and hence we turn to milk and eggs. Milk is particularly valuable because it alone of all foods contains in itself all the nutritive elements of a general diet. There are perhaps other types of food more fattening, but none which fulfil so well the general indications, in furnishing an equal amount of nourishment, an equal variety of nutritive elements, in being so easily digested, and in leaving so small a residue for the intestine to handle.

In advanced cases whose digestion is very poor, it may be necessary to cut out all solid food in order that they may get the necessary caloric value in their diet and in order that they may digest the amount of milk and eggs necessary to this end. The difficulty some patients have in taking milk and eggs lies too often in the doctor's desire to have them take solid food as well. Their want of appetite and impaired digestive power often makes this impossible at first. I have seen patients who could not take two quarts of milk and four eggs and one solid meal a day; but in

my own experience I have known few cases where, beginning, if necessary, by the omission of all solid food, it was not possible for the digestion to assimilate milk and eggs perfectly. There are many interesting phases of this question of diet, which I have not at present the time to discuss. I will close this part of the subject by giving a reasonable dietary for the average case of moderately advanced tuberculosis, for, let us say, a man of the working or artisan class.

The day should be begun early and this will naturally be the case if the patient is sleeping out of doors. He should at any rate be awakened in time to begin taking nourishment at seven A.M. At this hour two glasses of milk and two eggs are taken with toast and butter, cereal, and fruit; at ten A.M., two glasses of milk with crackers or bread and butter are taken; at one P.M., lunch or dinner; at four P.M., two glasses of milk; at seven P.M., two glasses of milk and two eggs with bread and butter and jam. At eight-thirty sleep.

The above diet contains two quarts of milk and four eggs and one solid meal. Where the patient cannot assimilate this diet, it must be modified, preferably by modifying the midday meal either by cutting it out altogether and substituting milk and eggs or changing its character. When the patient has a naturally large appetite, general articles of diet may be added to the breakfast and supper, or an egg added at ten A.M. and four P.M. Milk and eggs are best given at three-hour periods as above. Meat once a day seems ample for acute febrile cases.

It should be noted that the appetite of tuberculosis patients improves with the improvement of their condition, and that both appetite and digestion show a marked stimulation from improved hygiene. One of the most salutary effects of the rest and fresh air is an improvement in the ability to take and digest food. It is important, if a patient is going about and running any temperature, that he should rest before and after meals. This applies particularly to the midday or heavy meal.

All foods which do not nourish or are indigestible should be avoided. Of the use of substitute preparations or special foods, as, for instance, a pure meat diet or the various extracts of fats, vegetables, or special milk preparations, I shall say nothing because,

in my judgment, they do not fulfil the requirements of a general and natural diet. There is no specific food, just as there is no specific drug and no specific climate, nor do we need nor want anything better in the way of diet than that which nature, unassisted by the facile ingenuity of man, has made available and familiar to everyone.

I would be understood then as discountenancing the use of any drug routinely in the treatment of tuberculosis. If you feel that you must give something or the family will think you are not doing justice by the case, give a little strychnine three times a day or a simple gastric tonic like nux, soda, and gentian. Personally, I seldom give anything.

Of course there are times, certain phases of the disease, certain complications, and certain emergencies, when drugs must be used, and if used wisely, will prove of great service. Such circumstances are not the rule, however, and are, in fact, uncommon. There are very few cases that could not, on their own merits, be treated from beginning to end without the use of a single drug.

One word about the use of tuberculin. The use of tuberculin is confined largely to those physicians who are in charge of or resident in special sanatoria, or men who have had such experience. While the technic of its administration appears simple, yet this is the least part of it, and tuberculin should not, in my judgment, be used by anyone who has not studied its administration in expert hands and who has not a thorough working knowledge of the subject both from the experimental and clinical side. It is not very generally employed, therapeutically, though I believe its use is growing. Certainly all those best qualified to judge of its efficiency speak highly of it. They believe that it hastens cure and renders a cure more permanent.

Without attempting to go into the subject, let me say that, in many respects and in essential details, both the theory and the practice of its use are mooted questions. There are two widely different theories for its method of administration and mode of action. In one the effort is made to produce a greater or less degree of specific immunity to the tubercle bacillus itself. This is the so-called vaccination theory or antibacterial immunity. In the other an effort is made to produce an immunity to the toxins

of the bacillus, to produce a toxin tolerance. This is the so-called antitoxic immunity. No less an authority than Trudeau, recognizing, of course, the essential differences in the method of administration and choice of preparation as well as in final aim of treatment in the two instances, believes that until more accurate knowledge of tuberculin therapy is obtained, opinions will differ widely and even diametrically as to the best method to be employed; and, further, he admits that neither theory is entirely satisfactory. Therefore, my feeling about it is a somewhat non-committal or expectant one. Tuberculin is a toxin of great potency; capable, no doubt, of doing good in certain cases, but also capable of doing great harm when unwisely used.

I confess also to being quite optimistic about the results of the present-day treatment of tuberculosis without the use of tuberculin, and to being influenced by the strong tendency which these cases show to get absolutely well on general measures alone. This tendency to recovery is seen not only in practically all cases taken reasonably early, but in many of even the more advanced cases; and it is seen in the scientific facts that many more people have tuberculosis than die of it, and that in many instances where tuberculous infection has even reached the lungs, as proven by subsequent autopsy, the disease has never developed clinically.

Everyone hopes earnestly for a truly specific therapy and not a "near" specific, and until that great day arrives, let us stick to our measures of known and proven value, our trilogy of fresh air, good food, and rest, the greatest of which is rest.

THE PRESENT POSITION OF ANTITETANIC SERTHERAPY

BY DR. L. LAGANE

PARIS, FRANCE

RECENT discussions before the Society of Surgery and the Academy of Medicine revealed the fact that the opinions held as to the value of the serum treatment of tetanus vary between very wide limits; and, furthermore, the apparent contradictions between the results of the experience of veterinary surgeons and of other surgeons appear to render this question more complex still. In spite of this difficulty it yet seems possible to come to a fairly definite opinion on this question.

The results of observations made on animals are absolutely precise: the antitetanic serum has no effect on a case of tetanus in evolution—except perhaps when administered in intracerebral injection—and confirmed tetanus in animals is always fatal; but, on the other hand, its preventive power is absolute, if it is injected before, or at any rate shortly after, the production of a tetanus-infected wound.

In man, on the contrary, observation is remarkably varied, its interpretation contradictory, and many cases warrant the following two unexpected conclusions: (1) a possible *curative* action of the serum; and (2) an uncertain *preventive* action.

Is it allowable for us to draw conclusions from animal to man, and is it legitimate to take into account the thousands of accurate observations of wounded or operated horses that have escaped tetanus, since the systematic use of the serum? And, in particular, is it not possible that in man there may be a resistance to the immunizing action of the serum, depending especially on the fact that a heterogeneous serum is introduced into his system? But the same objection is applicable to cattle, sheep, and all animals that are treated, like man, with horse serum, and these, notwithstanding, furnish just as good results as the latter animal. Besides this, the experiments of Dehne and Hamburger have proved that the blood of an immunized man shows the same biological reactions

in the presence of tetanus toxin as that of the horse. An analogous serum, the antidiphtheritic serum, produces similar effects in man and animals. The most that can be said is, to quote Ramson and Kilashima, that the passive immunity obtained by an injection of a heterogeneous serum is of shorter duration than the immunity conferred by a serum of the same species.

We can then reply affirmatively and accept the contribution brought by the observations upon animals a contribution all the more precious in that tetanus in man is relatively rare (about 13 fatal cases per annum in Paris), and that precise observation of its inoculation conditions is not easy.

In certain instances the serum given in large doses appears to have had in man a curative action, whereas this does not seem to be the case in animals. This observation is perhaps true; yet it is also beyond question that man may recover from tetanus spontaneously or at least with the help of the classical treatment by means of large doses of chloral and morphine, which it would be dangerous to omit. It is therefore possible that the cases that recovered with the serum would have done so without it, and this hypothesis is all the more plausible in that the larger number were cases that ran a slow course, or else were incomplete cases, such as cephalic tetanus.

In addition to the curative treatment by means of the usual hypodermic injections of serum given daily in large doses, Borrel has recommended intracerebral injections. Though he has obtained excellent results in animals, the antitoxin of the serum thus neutralizing the tetanus toxin at its place of predilection and at the moment when it is producing its harmful effect, the results in man are not so conclusive. The intraspinal injection has not given very satisfactory results either; but on the other hand it seems that the intravenous injection, which produces a more rapid effect by the antitoxin, can be safely advised.

We now come to the most important question in the discussion: the value of a *preventive* injection of antitetanic serum. Reynier has published forty-one cases in which tetanus occurred in spite of such injections, and where, furthermore, the gravity of the disease was not modified, since in a series of eighteen cases in France there were thirteen deaths. Vaillard rejects a certain number of

these cases as untrustworthy, on account of the defective conditions under which the serum was administered—either insufficient amounts or too long a time after inoculation. There remain, however, a certain number of cases in which there remains no question that tetanus occurred in spite of preventive injections of serum.

As a matter of fact, however, there is nothing in this to surprise us, the antitetanic serum having only a very limited and short effect, and, we should be inclined to add, if we were not afraid of being misunderstood, an effect that is entirely accessory. For this reason it is absolutely necessary that the serum should be administered under proper conditions, if it is to have a maximum chance of success.

This serum has merely the action of a counter-poison or antidote, and even that in an entirely temporary manner. It has no effect on the tetanus bacilli localized at the point of inoculation; it does not impede their development; and it does not hinder the germination of the spores. Its rôle, which is a very limited one, is to render inoffensive the toxin circulating in the blood by combining with it. It has not even any effect on the toxin fixed on the nerve cells, as the latter have an elective affinity for the tetanus toxin, and do not allow themselves to be impregnated by the antitoxin, which would be for them a liberating agent.

Landouzy, in his work on serotherapy, has clearly shown the difference in action between these merely antitoxic sera, such as the antitetanic and antidiphtheritic, which are supplied by animals treated with progressively increasing doses of bacterial poisons, and bactericidal sera, such as the antistreptococcic, supplied by animals vaccinated with virulent cultures of microbes. The latter prevent the generalization of bacteria in the system, and put a stop to their development, which is just the opposite to what takes place with the case we are now examining.

Finally, this antitoxic action of the serum is entirely temporary, as its effect does not last more than a week. After that time, if the tetanus wound still exists, and particularly if there are local complications which through microbic associations facilitate the development of the tetanus bacilli, the toxin secreted, no longer finding any antitoxin to neutralize it, will produce its customary results. When, on the contrary, the provision of antitoxin is

renewed in proper time, its preserving power is prolonged for a fresh period. Furthermore, the amount of antitoxin injected is fully as important as its quality.

It is therefore necessary, as quickly as possible, in all wounds that are crushed, deep, or contaminated with foreign substances; in irregular wounds with mortified tissue and hemorrhagic foci, and in compound fractures, to inject at once not only ten but twenty or thirty cubic centimetres of serum. Afterwards, if the wound remains open, ten cubic centimetres should be administered every week. The dry serum recommended by Calmette is not as active as the liquid serum, and should be used rather for wounds that are superficial, easy to disinfect, and not likely to contain tetanus germs.

But the true preventive treatment of tetanus is the removal of infectious germs by every possible means: asepsis, antisepsis, and even surgical intervention if necessary. For the bacillus may continue to develop for a long time at the point of penetration, especially in regions where phagocytosis is not very active, as in muscular tissue. Its spores sometimes germinate even several weeks after inoculation, after 30, 50, or even 90 days of incubation. Such conditions give a sufficient explanation of the cases in which serotherapy fails to act.

The difficulty of the part that antitoxin has to play is still further increased by the unfavorable conditions under which it has to act, due to lack of the symptomatology of tetanus itself, and to the uncertainty of the very existence of tetanus so long as the reaction of the cerebral cells affected by the poison fails to reveal the presence of an infectious focus. In this way the antidiphtheritic serum is much more favored, as its necessity is immediately made evident by a local reaction. Owing to the appearance of this danger signal the antitoxin succeeds in getting ahead of the intoxication of the system.

This is not all. It is possible that in some cases, in spite of its judicious administration, the inefficacy of the serum may depend on certain phenomena which are as yet not well understood but to which Roux has called attention. There may take place *in vivo* in the serum used for inoculation a dissociation of such a nature that a certain amount of active toxin is set at liberty. A high rise of

temperature, and the presence in the subject inoculated of microbic substances, seem to have been, in part at least, responsible for inducing this phenomenon. Still, it must be admitted that this is a very exceptional occurrence.

A final criticism has been made of the use of the tetanus serum: the possibility of accidents after its administration. Among these, some are ordinary serum accidents, such as take place after any injection of horse serum in a human being. These are partial or generalized erythema, urticaria, arthralgia, myalgia, and localized oedema; they are harmless and temporary, and can even be avoided by the administration of calcium chloride for three days after the injection. It is quite unusual for these accidents to take a more serious form.

This is also true for accidents of a similar nature, but more marked, that sometimes occur when the serum injections are repeated. In such instances the patient usually reacts to the first injection by one of the skin symptoms mentioned above. This hypersensitiveness, which Richet has made known by the name of *anaphylaxis* and whose nature is still very obscure, may be partially avoided by taking care not to change the mode of administering the serum—for instance, not to give first a hypodermic injection and then an intravenous one.

There is still another order of symptoms to be considered which are caused by the serum—though from a merely theoretical point of view, as we do not yet know of a single instance in man—and which are specific: namely, the appearance of symptoms of tetanus after the use of tetanus antitoxin. This could be explained, as we have already pointed out, by the dissociation *in vivo* of the atoxic compound, with a setting at liberty of toxin. It can be logically supposed that such symptoms would be light and evanescent.

We will end by repeating with what strict precaution the preventive serum treatment of tetanus must be carried out, in order to acquire its complete efficacy in man; and how valuable it is is clearly shown by experimentation on animals. Still, one can not pretend that antitoxin will take the place of the surgeon, but should only aim at neutralizing with its use the toxic effects of microbic secretion, until the surgeon can succeed in disinfecting the wound.

MESMER AND PERKINS'S TRACTORS

BY DAVINA WATERSON

BALTIMORE, MD.

THERE are, even to-day, many of the laity who do not know that a personality has been absorbed into an art or system; that behind "mesmerism" is the figure of a thoughtful student of medicine, one Francis Anthony Mesmer, of Swabia, M.D. of Vienna, who came into the world in 1733 to worry the learned and fascinate the crowd with his "magnetic cures." His thesis at once proclaimed him eccentric; for what ordinary medical student would go so far above the heads of a college as to present a dissertation "*De Planetarum Influxu in Corpus Humanum*"? Perhaps a somewhat grim fight to pay his student's fees under the celebrated Van Swieten and De Haen had made him seek the extraordinary, the hidden, the mysterious, as a solace for the hard, relentless blows of poverty. The thesis provoked some anger and much ridicule, but the author, having married a rich lady, was to a certain extent independent of his detractors, and set up as a practising physician in Vienna.

Ten years later we find him undertaking cures by means of magnets, while the Imperial astronomer, Père Maximilian Hill, makes for him many magnets of different shapes and sizes, which are drawn over the affected parts, at times putting the patients in constant communion with the magnets. Ridicule shrinks away, high-stepping success attends Mesmer's practice, and the nobility, who, then as now, suffered from "nervous prostration" and "nervous prosperity," crowd his door. The ubiquitous journalists are also not lacking; cures are reported in the Viennese journals, and, most wonderful of all, Austrian medical men and those of other countries confirm and approve Mesmer's discovery.

Had he been an ordinary quack mere money-making and popularity would have satisfied him, but the student was not lost in the popular doctor. He soon noticed that the power existed in himself independently of the magnets; that he could influence the patients without touching them; that he could communicate his power to

glass and iron and thence to the patient. His rooms became the rendezvous not only of the really sick but of the fashionable *malades imaginaires*, who came to see, to wonder, and to chat. Court physicians took alarm; the Empress's physician, Baron Stoerk, so damaged Mesmer's success that he was obliged to go on a tour to Bavaria and Switzerland, making, however, many cures and gaining great reputation during his journey. He also sent pamphlets to the Royal Societies of London, Paris, and Berlin. Not a word in reply came from the first two! but a request for explanation from the third, which Mesmer was foolish enough to refuse.

There seemed no chance of success in Vienna, and 1778 saw Mesmer in Paris again carrying matters with a high hand and declining to submit some experiments to the Society of Medicine or have the state of his patients authentically diagnosed before he began treatment. Nevertheless, the fashionable world took him up; marvellous cures of rheumatism and nervous disorders were made, bringing £16,000 in fees in two years; but Paris at that time was in such a high-strung condition politically and morally that anything new attracted attention.

Curiously enough, Mesmer won the patronage of Dr. D'Eson, President of the Medical Faculty of Paris, and published a pamphlet which D'Eson offered to defend before the Academy of Medicine, a rash offer that led to his being suspended as Dean of that body for a year.

Then came another triumph. Count Maurepas, Minister of State, invited him to publish his doctrine and system for the benefit of mankind. "Ridiculous," wrote Mesmer in reply, "to require new proofs of animal magnetism;" but in conclusion he asked that a certain estate should be given him as a reward for his discovery. This somewhat impertinent demand seems to have made the government think there was something really valuable to be learned from his methods. Baron de Breteuil was commissioned to offer him in the king's name a pension of \$4000 for life and a donation of \$2000 provided that he established a "*clinique magnetique*" and instructed three State-appointed persons in his methods.

Mesmer refused! No one knew why. He gave as reason that a widespread knowledge might lead to abuse, and he soon after hurried away to Spa, followed by many patients and enthusiastic disciples.

A still greater surprise awaited Paris. Dr. D'Eslon seceded from the faculty, pretended that he held Mesmer's secret, and set up a mesmeric hospital to which crowds flocked. "Traitor, imposter," cried Mesmer. "He will make a fortune, while I, the discoverer, die in poverty," but while Mesmer fumed, a certain set of admirers, among them Lafayette, agreed to establish a company, each taking one hundred shares at \$500 each, on condition that Mesmer should at some time reveal to them his secret. Meanwhile one of them delivered a theoretical course of lectures on magnetism to which thousands flocked. Mesmer's observant eye noted how mystery dominated the public mind. "Let us," he said to the shareholders, "be a secret society called 'Harmony' and I will reveal my secret to the founders."

He was right; great was the power of mystery, and soon shareholders to the amount of \$70,000 subscribed.

There was no gloomy ante-room for his patients, with last month's magazines and inferior engravings and framed diplomas. The room was lined with mirrors and kept in a state of half-darkness. Delicate scents refreshed the air and an artist—there were no graphaphones—performed dreamy airs on the harmonica. No patient of repulsive appearance was admitted, but treated apart. In the centre stood a large vessel or tub, the interior unexplored except by the chosen few. A large bar of steel hung over the tub, which Mesmer, from time to time, thrust down to the bottom to rekindle the magnetic power.

One may picture to himself the condition of affairs. A crowd of educated persons sit round the room, all holding small steel rods connected by silk cords with the central bar. Occasionally a patient drops the bar and puts her finger on her neighbor (*former la chaine*), a nervous emotion or "crise" begins to seize all. They are ready, and Mesmer sits down in front of each in turn and does the usual passes from which the lady with "the vapors" in 1787 derived as much benefit as the neurasthenic of to-day from her favorite quack remedy.

No great harm is done if this were confined to one city, but the Mesmeric mania spread over France with the usual gross abuses. "Let us have a Royal Commission," shouted a government which had once offered an annuity to the very man whose doings it now

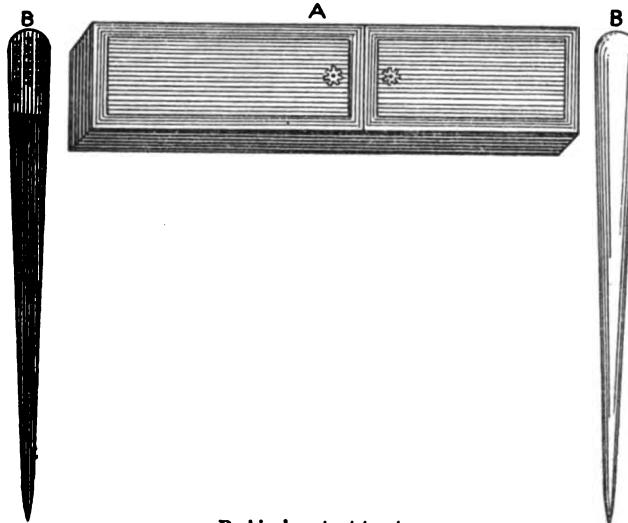
decided cried for investigation. The commissioners' names are not all unknown to fame: From the Academy of Sciences were Benjamin Franklin, Le Roi, Bailly, De Bori, Lavoisier, Bovie, Sallin, D'Arcet, and Guillotin of unsought Revolutionary fame; from the Society of Medicine, Poissonier, Desperieres, Caille, Manuyte, Audry, and Jussieu. Surely men enough and brains enough to detect imposture!

But even as the wise men of the University of Salamanca decided that Columbus was an imbecile and an impostor, so these men declared Mesmer a second Cagliostro and his electric cures a compound of imagination and sensuality. One thankfully omits two names from the signed report delivered to the King. Franklin was too ill with the gout in Passy to take much share in the Commission, and Jussieu (founder of the natural system of botany) declined to sign. Afterwards he wrote a pamphlet in favor, not of the methods used, but upon the scientific part of the discovery. The fact that Dr. D'Eson was the chief witness in the trial did not argue for a favorable report, for he disliked Mesmer. Twenty-one doctors were forbidden under penalty to practise Mesmerism and seventeen obeyed. The country was flooded with pamphlets, scandals, and quackery until the Revolution diverted the thoughts of aristocratic invalids from warding off imaginary disease to keeping their heads on. Mesmer went to London, where he lived under an assumed name and does not seem to have practised there at all, though the stolid Britisher was even then being led astray imaginatively by one of our own medical confrères, a certain Dr. Elisha Perkins and his magnetic tractors. Mesmer returned to Germany and published a new exposition of his system which met with that most powerful of all oppositions—indifference. He was too tired to try again. Enthusiasm wanes a little at fourscore, and far away in the little town of Thurgau, Switzerland, the famous Mesmer passed away, to be reincarnated, perhaps, in some of the noted hypnotists of to-day.

If one climbs up to the dustiest shelf in his library and scans American and English medical journals from 1780 to 1800, he will see enquiries into, criticisms on, exposure of, and finally, in the time-browned pages of the *Medical Repository* for 1800 this ominous paragraph concerning Dr. Elisha Perkins and his retractors:

“ WHEREAS Dr. Elisha Perkins, a member of this Society, having obtained a patent from under the authority of the United States for the exclusive privilege of using and vending certain pointed Metallic Instruments, pretending that they were an invention of his own; and also that they possess inherent powers of curing many diseases, which is contrary to rules and regulations adopted by this Society, interdicting their members the use of nostrums—Therefore: *Voted*, That the said Elisha Perkins be expelled from the Medical Society of the State of Connecticut.”

FIG. 1.



Perkins's patent tractors.

These “Metallic Instruments” were the invention of Dr. Elisha Perkins of Connecticut for the cure of “Rheumatism, Gout, Erysipelas, Tetter, Epilepsy, Lockjaw, Pleurisy,” in both *men and horses*, and were used in perfect good faith by the inventor, and in equally strong faith by thousands in the States, raising the same storms of opposition and criticism which Mesmer had to face, but also bringing in the same consolatory flood of gold (Fig. 1). The *Tractors* were two instruments, apparently, one of brass, one of steel, and pointed at the end, these points were drawn over the affected parts for about twenty minutes. Cures could be effected by patients themselves by paying the modest sum of \$30 “for a portable set in a red morocco case.”

The following is an extract from a letter:

" BREWER STREET,
24. Feby. 1803.

" J. D. went this morning to the several offices in Chancery Lane, where *Patents* are recorded, and in *that* called the *Rolls Chapel Office*, he found the Record of the Patent granted on the 10th March in the 38th of Geo. 3rd, to Mr. Benjamin Douglas *Perkins* from N. America, in the specification of which Mr. P. says that the object of his Patent is an application of what is called *Galvanism*, and that his *Tractors* (in consequence of the effects observed to be produced on human and other animal bodies by certain *Metals*) are composed of *Copper*, *Zinc* and a little *Gold*, and of *Iron* united with *a very little Silver or Platina*."

Physicians and surgeons, divines and philosophers, men and women, sheep and horses, all were "perkinized" and all benefited. A patent was obtained and Thacher, the medical biographer, says that Dr. Perkins "travelled through the country to disseminate his new practice." As we hear further that he could ride "sixty miles a day without the use of ardent spirits" and repair by six minutes' sleep the loss of hours of rest, we can imagine this energetic Perkins, cloaked and spurred, riding over the country with sets of tractors dangling from his belt à la John Gilpin. Hospitals and infirmaries opened their doors to him. Leading doctors and professors of three universities gave cautious approval; testimonials came in thick and fast from men high in office and from the elect in society. The fame of the Tractors reached Europe just as Mesmer returned to Germany from London. The medical stage was to see another actor: exit Mesmer; enter Perkins, with an audience equally ready to applaud both. At Copenhagen twelve physicians and surgeons made fifty experiments and found "there was a great deal of reality at bottom." The king's physician translated their resultant pamphlet into German; a German doctor translated it into English; and 1803 saw Perkins in London with tractors and detractors, using both to further his own cause.

He lived in the house once occupied by John Hunter, and in 1804 the *Perkinean Institute* was opened, but by the end of 1802

5000 cases had already been treated. Lord Rivers was President, Sir Wm. Barker Vice-president. Twenty-one physicians, nineteen surgeons, and the leading veterinaries succumbed to the influence of the magic tractors. One "eminent physician" who had had 30 guineas from a country patient and done him no good was very angry when the sick man took to Perkinism.

"Why, I could have cured you in the same way with any old brick-bat or tobacco pipe or even my finger."

"Then why, sir," answered the patient in a stern voice (Perkins quotes this) "did you dishonorably pick my pocket when you had the means of restoring me to health?"

In some 176 pages young Perkins gives us the pick of 2000 cases who had, of course, been foolish enough at first to put faith in the ordinary physician and his drugs.

In Bath particularly, where aristocratic London went, as they do to-day, to repair the damage wrought by a season in town, the Tractor Cure was the talk of the place. But an enemy dwelt there, a Dr. Haygarth, an unbeliever. He, with a certain Dr. Falconer, fabricated a pair of false tractors. Five cases of gout and rheumatism were operated on by the conspirators, who discussed in a light tone the wonders of magnetism as they described circles, squares, and triangles with the sham tractors. "We were almost afraid to look each other in the face lest an involuntary smile should remove the mask from our faces," says Haygarth, but the two assistant doctors, unaware of what was being done, were almost converted to Perkinism when they saw the five patients slowly mending under the treatment. One man experienced such burning pain that he begged to wait till the next day.

So rapid and so many were the hospital cures wrought by these two doctors that patients crowded to them and they could hardly spare five minutes to each. They amused themselves inventing other instruments made of common nails and sealing wax, and effected with them cures, while they sent a pair of false tractors to Sir Wm. Watson in London and Dr. Moncrieffe in Bristol, who operated with them with wonderful results.

When these cures were made public Perkinism began to die both in Europe and America. "This and Mesmerism," wrote a doctor, "are two of the most contemptible of the numerous bubbles which

the knavery and folly of the present day have clubbed their forces to unite." Just at this time too, appeared

TERRIBLE TRACTORATION
A POETICAL PETITION
AGAINST GALVANIZING TRUMPERY
BY
CHRISTOPHER CAUSTIC, M.D., LL.D.
(*Thos. Green Fessenden*)
London, 1802

ridiculing the Tractors and the doctors who believed in them:

Behold a rising Institution
To spread Parkinean delusion,
Supported by a set of sturdy men—
Dukes, quakers, doctors, lords, and clergymen.

Now learned physicians pine with hunger,
The while a spruce young patent-monger
Contrives to wheedle simple ninnies
And tractorize away our guineas.

But I, in spite of my renown,
Alas am harrassed, hunted down;
Completely damned, the simple fact is,
By Perkins's Metallic Practice.

Indifference succeeded indignation and patients weekly returned to doctors and drugs, unaware that from the graves of the two old men, Mesmer and Perkins, neither of whom were impostors but too far from the truth to be sheltered by it, would arise many men to rehabilitate and reconstruct the dominant idea which influenced Mesmer and Perkins.

The following is an extract from a letter from Dr. Benjamin Parker:

"All about Perkinism is perfectly true. I lived in those times. A gentleman in Virginia sold a plantation and took the pay for it in tractors. Nothing was more common than to sell horses and carriages to buy them. But the worst of it was, yellow fever was raging in New York and Perkins thought he could cure the fever with the tractors and fell a victim to the fever himself."

Medicine

CLINICAL OBSERVATIONS IN FIVE HUNDRED CASES OF TYPHOID FEVER *

BY JOSEPH H. BARACH, M.D.

PITTSBURGH, PA.

If there is one disease to-day in the domain of medical science that has been carefully, extensively, and successfully studied, that disease is typhoid fever. Because of its slow evolution, its deliberate course, and its many classical symptoms, it has lent itself especially well to careful analysis, both clinically and in the laboratory.

Epidemically and pandemically, especially in the northern temperate zone of both continents, occurring within or having created about itself medical centres, typhoid fever has been extensively studied from many viewpoints and there have been recorded careful analyses of many thousands of cases. While it is true that, in the aggregate, the number of real facts known to-day regarding typhoid fever is quantitatively greater than of any other disease in its class, there are still some of its most interesting phenomena to be understood. More vital than all is the inherent weakness of our knowledge toward a universally recognized specific treatment for the disease. Until all that can be desired is known, I consider it the duty of us who have the opportunity to study the disease and record our observations.

The observations to be recorded here were made in a series of 500 cases of typhoid fever which occurred within a period of two years (1904-1905) in hospital services of four of our Pittsburgh physicians, to whom I am much indebted. These cases I saw every day of their disease, and carefully recorded the events on the day of their occurrence. In this paper I will include certain observations which refer to the etiology, diagnosis, complications, and treatment of the disease.

* Read before the Allegheny County Medical Society, April 20, 1909.

ETIOLOGICAL FACTORS AND HISTORY

Nativity.—Of these 500 cases, 379 were males and 121 were females. The two hospitals in which these cases were seen are so located in our city that their wards are occupied principally by the native laboring classes and the foreign element.

NATIVITY AND SEX OF FIVE HUNDRED CASES.

Country.	Male.	Female.	Total.
Italy	83	1	84
Russia	86	21	107
Austria	67	27	94
America—White	74	53	127
America—Colored	17	7	24
Scotland, England, Ireland.....	20	3	23
Germany	11	5	16
Roumania and Galicia	5	2	7
Sweden	2	1	3
Finland	2	0	2
Syria	3	1	4
Corea	1	0	1
Greece	2	0	2
Switzerland	1	0	1
Japan	1	0	1
West Indies	2	0	2
France	1	0	1
Turkey	1	0	1
<hr/>		<hr/>	
Total	379	121	500

A mere glance at the table shows that the American population constitutes but 30 per cent. of the entire series. It will be seen later that the natives of Western Pennsylvania furnish even a very much smaller percentage than that. In perusing the available hospital reports of 1904 and 1905, of the various institutions in the city, I find that the number of typhoids which each hospital cared for varied in proportion to the percentage of foreign patients which they had. The accompanying table illustrates this point clearly.

HOSPITAL STATISTICS, 1904 AND 1905.

Hospital.	Number of admissions.	Percentage of Americans.	Percentage of medical cases.	Typhoid percentage of medical cases.	Total typhoid cases.
West. Penn.	6267	49.	44.7	46.8	1293
Mercy, 1½ years...	6705	64.7	38.4	14.4	363
Passavant, 1½ yrs.	1297	63.2	32.9	14.4	379

Another interesting and perfectly natural feature is that in our vicinity the number of typhoids is dependent also upon the influx and efflux of foreigners, which in turn is dependent upon existing industrial conditions.

Residence in Western Pennsylvania.—On this point we have accurate record in 300 cases. Of these, 30, *i.e.*, 10 per cent., have resided in Western Pennsylvania always.

Sex.	Age.
Males	Under 25..... 21
Females	Over 25..... 9
—	—
Total 30	Total 30

Here we have two interesting facts. Ninety per cent. of these cases have come from other States and other countries. Of those that have always lived here, two-thirds that acquired the disease were under 25 years of age.

These figures are typical of typhoid fever in the hospitals of Pittsburgh; and as to how representative they are of the cases that are treated in the homes of our vicinity we will only know after the Typhoid Fever Commission of Pittsburgh will have made its report, to which we will all look forward with much interest.

How long those having come to this vicinity, resided here before acquiring the disease is shown in the following table:

RESIDENCE IN WESTERN PENNSYLVANIA.

Percentage.	Time of Residence in Western Pennsylvania.
10	Always.
76	No longer than 5 years.
60	No longer than 3 years.
49.24	No longer than 2 years.
31.23	No longer than 1 year.
10	No longer than 8 weeks.

Age and Sex.—The ages of these patients point distinctly to the fact that the disease is one which occurs in the most active years of life, 89.2 per cent. of cases occurring between the ages of 15 and 35 years.

AGE.		
Years.	Male.	Female.
1-10	4	0
10-15	7	8
15-20	62	34
20-25	113	39
25-30	96	22
30-35	59	11
35-40	22	2
40-45	12	2
45-50	4	0
50-55	0	2
55-60	0	1
	379	121

Sick at Home.—Most of the cases entered the hospital before the end of the second week of the disease, while nearly half of them entered within the first week of their illness.

DURATION OF ILLNESS.

Males.	Entered hospital within first 7 days of illness.....	44.08 per cent.
	Entered hospital within first 14 days of illness.....	86.02 per cent.
Females.	Entered hospital within first 7 days of illness.....	42.35 per cent.
	Entered hospital within first 14 days of illness.....	87.75 per cent.

STAY IN HOSPITAL.

The recovery cases spent on an average of 34.69 days in the hospital.
The fatal cases spent on an average of 12.82 days in the hospital.

Previous Attacks.—In this series 15 gave a history of having had the disease once before and one of having had two previous attacks. Of these, four had their former attacks in our own hospitals, and on referring to their histories, we find that they did have typical attacks.

PREVIOUS ATTACKS.

No. of cases.	Time since a previous attack.
3	1 year.
1	2½ years.
2	3 years.
6	4 years.
1	10 years.
1	14 years.
1	More than 14 years.
1	11 and 22 years.
	—
16	

DIAGNOSTIC CONSIDERATIONS

The Widal Reaction.—This test in almost all of these cases was made by Dr. E. G. Matson. Before permitting an assistant to perform these reactions, Dr. Matson always works with him for a certain length of time, so as to eliminate any error of personal equation. In this series I believe this has been entirely eliminated. Dr. Matson uses the whole blood, and, as compared with the test when the serum alone is used, Dr. Matson considers that our $1/4$ dilution equals $1/10$ dilution, the $1/12$ equals $1/20$, the $1/50$ equals $1/80$. In 423 cases in which the test was made, positive reactions were obtained in 95.99 per cent. of the cases, while negative reactions were present in 4.01 per cent. In three cases at the time in which positive blood cultures were obtained, the Widal reaction was negative. Of these cases, one on the forty-first day of the disease gave a $1/50$ Widal, and the other on the fifty-sixth day gave a $1/4$ positive Widal. On figuring up the time in which the last Widals were taken in the entirely negative cases, I find that the average was on the twenty-third day of the disease. Considering the evidence from the above two cases, we may assume that probably an even larger percentage of positive Widals would have been obtained if the test had been made over a longer period. It may also be that in some cases the reaction occurs and lasts for a brief period of time, in which case, if the test is not made at frequent intervals, it would be altogether missed. There is also the possibility of some of these negative cases not having been genuine typhoid although in 100 cultures paratyphoid was found but once.

The Diazo Reaction.—In this series, the diazo reaction was irregularly made and the percentage of positive findings seems far too low. As Resident Pathologist at the Western Pennsylvania Hospital, where I introduced the routine examination for that reaction, I at first met with much discouragement on account of its supposed worthlessness. It was not long, however, before the visiting staff began to ask for it, and toward the end of my service they admitted that it possessed a distinct value if properly interpreted. In a series of 224 typhoids, I obtained a positive reaction in 86.75 per cent., while in specimens of urine from 1500 hospital cases other than typhoid fever, I obtained a reaction that resembled the diazo

eleven times.¹ In these eleven cases it so happened that there was at no time a serious consideration of typhoid fever in the differential diagnosis.

Whatever the product of abnormal metabolism in this disease may be, my observation leads me to believe that the reaction can almost always be obtained in the beginning of marked cases with high temperature and before internal hydrotherapeutic treatment is begun. One reason why this reaction has been in so much disrepute is because of the way in which it is frequently carried out. After the Widal, it is the most decisive laboratory test that is within reach of the general practitioner of medicine.

Leucocyte Count.—In a series of 150 cases the average count was as follows:

Day of disease.	Number.
1-10	6226
10-15	6580
15-20	6456
20-30	6596
30-60	6532

In those cases in which the count was made during the first week in the hospital, in which there were no known complications, the average was 6252; while in those cases having bronchitis with no other known complications, the average was 7974.

There were certain other occurrences worth recording. One case, in which typhoid bacilli were isolated from the blood on the thirty-second day of the disease, showed streptococci in the blood on the thirty-sixth and sixty-seventh day of disease. On the sixtieth day the leucocyte count was 5660. In this case, three negative Widals were obtained, and the fourth Widal on the fifty-sixth day in $\frac{1}{8}$ dilution was positive. There were two other cases of mixed bacteriæmias. One case of pleurisy with effusion complicating typhoid, from which 250 c.c. of fluid were removed, showed, before removal, a leucocyte count of 24,000; after removal, 18,000. We may have pleurisy with effusion without leucocytosis. One case, having a severe endo- and pericarditis, on the twenty-second day showed a leucocyte count of 8600; on the twenty-eighth day typhoid bacilli were recovered from the blood; during this time there were two $\frac{1}{8}$ negative Widals. One case three months pregnant gave a leucocyte count of 8640. One case seven months pregnant gave a

leucocyte count of 8850. One case of severe phlebitis had no leucocytosis, and one case showed a leucocyte count of 18,000.

Spleen.—Enlargement of this organ is a classical symptom of the disease. In this series of cases, during the first week in the house, the spleen was palpable in 58.7 per cent. In our wards we frequently see what we speak of as the "Italian spleen," which we accept as being the enlarged spleen of chronic malaria. Those spleens become distinctly larger during the height of the disease, and diminish in size upon convalescence, but even then they are often easily palpated. While in such cases we frequently examine the blood for plasmodia, not one case of mixed infection was discovered in this series, nor have I ever seen more than one case of typhoid fever in Pittsburgh in which the plasmodia were discovered, in about 2500 cases.

COMPLICATIONS

One case of amaurosis occurred in this series. The condition lasted three days, and it was followed by gradual improvement up to normal vision after convalescence. Examination with the ophthalmoscope at the time of total blindness revealed nothing abnormal in the fundus.

Erysipelas.—Three cases occurred—within a month—one of which died. If there is one consternation to the medical man in a hospital ward, it is to have a case of erysipelas appear, and then another, and then another. When in charge of the contagious department at the Western Pennsylvania Hospital, in a period of about six months, I had twenty cases of erysipelas that were sent from the three medical wards.² That this serious complication occurs in epidemic form is sufficient accusation of faulty technic somewhere in the asepsis of our medical wards. I mention this complication especially to call attention to that admirable and timely discussion of the subject by Edsall.³ It is only by carrying out details as laid out by that careful investigator that we can come nearer to ridding our wards of such complications in the future.

Bronchitis.—This occurred in 150 cases of this series. In the spring and summer months, in 190 cases of typhoid fever, bronchitis occurred in 20.46 per cent. of the cases. During the winter

months, in 310 cases, it occurred in 21.7 per cent. These percentages show that the season of the year is not of much influence as a cause of this complication. I believe that the mild degree of leucocytosis that occurs with this complication suggests that a mixed infection becomes active in, at least, a fair proportion of the cases.

Pneumonia occurred in 5.6 per cent. of the cases. Of the 28 cases, 13 died. Four of the cases were double pneumonia, two of which recovered.

Pleurisy.—Dry pleurisy occurred sixteen times, and pleurisy with effusion four times. Three of the cases of dry pleurisy were in pneumonia cases, and eight were associated with bronchitis. In the effusion cases not more than 250 c.c. had accumulated, and there were no recurrences after the fluid was once removed.

Hypercatharsis and Diarrhœa.—A patient having no more than three stools daily, such as we often see after administration of cathartics, was considered as having hypercatharsis. A patient having more than three watery stools daily, especially when independent of cathartics, was considered to be having diarrhœa.

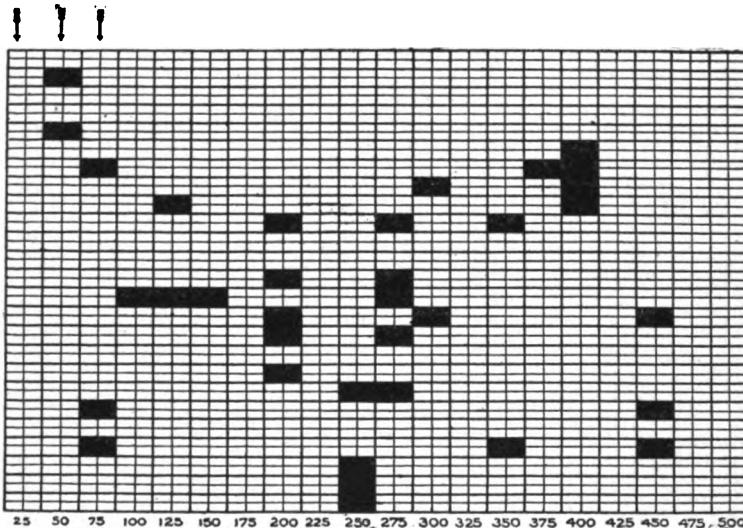
In this series there were thirty cases of hypercatharsis and ten cases of diarrhœa. In the ten cases, the diarrhœa always seemed to be a serious complication. These patients were exhausted and depressed, so much so that they really appeared to be suffering from another serious infection along with the typhoid. It would be well worth while to investigate all such cases by making a series of cultures from the stools and to compare them with those of the usual typhoids.

Hemorrhages.—There were thirty-five cases; twenty recovered, fifteen died.

With the pathologic anatomical changes leading up to this complication we are all well acquainted; but of the pathologic physiological occurrences that precede this serious complication, up to the present, we know very little. We know very little of those conditions which determine the degree of inflammatory reaction that occurs within the lymphoid tissues of the intestines, and, as a result of this, the occurrence of hemorrhages, so far as we are concerned, is purely a matter of fate. Occurring in but 7 per cent. of the cases, we may well consider it an unusual complication and therefore not necessarily a part of the disease. Admitting that it

is not a part of the disease, may we not venture one step farther and suppose that its determining cause might perhaps be some factor within our control if we could but find what that cause is? In my daily rounds in the hospitals, I have been forcibly struck by the frequent coincidence of this complication. After a time of quietude in the wards, a case of hemorrhage would occur, and, as was the custom at the time in which these cases were studied, the foot of the bed was raised. Perhaps on the following day, on

FIG. 1.



Hemorrhage cases, 35; 500 patients. This chart contains 500 blocks, representing each case in the entire series, in the exact rotation of their entering the hospitals. In the first 25 cases not one hemorrhage occurred. Cases 27 and 30 had hemorrhages. This was followed by a period of quietude, after which another case occurred, and that one was followed by two more. These concurrences are to be seen throughout the entire series. The hemorrhages occurred at the usual time of the disease.

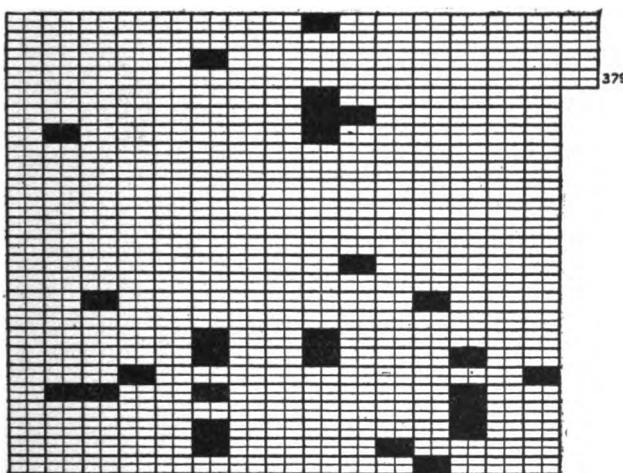
entrance to the ward, I would see another bed raised, and, at times, still another. In such times, a cloud of superstition hangs over one's mental horizon, and yet one is reluctant to accept such fatalism.

I have studied the occurrences of the hemorrhages in this series and the result is indeed striking. In the chart there are 500 blocks, one for each case. From left to right, down the columns, you may see in what groupings these cases occurred. Their rotation is according to the time of entrance to the hospital. I did not find that such groups occurred in both hospitals at the same time.

On a number of occasions, in the cases of this series, and since then, I noted hemorrhages that occurred in striking groups during the summer months, on dark, humid, oppressive days preceding or during rains.

Whether such external influences have some effect upon the patients, upon the infections, or upon the quality of the patients' food (milk, it is needless to say), we do not know. That the coincidence is striking I am certain, and if this observation is confirmed in the future, the thing to do then is very clear—find out what the cause is.

FIG. 2.



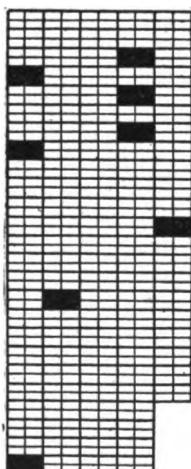
Hemorrhage cases: males, 27 cases; 379 typhoids. This chart represents the simultaneous occurrences of hemorrhage cases. It will be seen there were times when we had four or five hemorrhage cases in the male wards.

If I were to begin such an investigation, I should study first the bacterial findings of the mouths of patients, of the foods which they get, and of the stools. It might be that hemorrhages and also perforations are the result largely of mixed infections of the intestinal wall, perhaps, also, not entirely beyond our control. Peristalsis and fermentation are the two most likely determining factors of these complications, while the mixed infection of the intestinal wall may be the predisposing factor in most cases.

As a crude object lesson, I would ask any one, if a patient came to him with a wound on his forearm as large as the Peyer's patch we frequently see, whether he would permit that patient to use

his forearm if he knew that the wound could be easily lacerated and start bleeding. And now let us compare the proportionate sizes and delicacy of the wound in the forearm and the Peyer's patch in the ileum. Practically speaking, we can easily see how curds of milk can become very dangerous. First, as indigestible material, they keep up an active peristalsis; and secondly, they give rise to fermentation. Fermentation increases peristalsis by nature's attempt to expel the flatus; and if there is sufficient fermentation, the bowel is paralyzed and its weak spots are endan-

FIG. 3.



Hemorrhage cases: female. This chart represents 121 female typhoids in which there were eight hemorrhage cases. The chart shows how close together the hemorrhage cases occurred.

gered. Of late I have been observing typhoid patients on their fasting days, and I find that peristalsis is very quiet, often inaudible at one spot for half a minute at a time; and this is very different from the patients who get the regular feeding.

I believe the point I wish to make here is very clear—in the second and third weeks of the disease we should permit nothing that will increase peristalsis and fermentation to any extent.

Perforation.—There were seven cases, three were operated on, all died.

Of this complication I shall say little. The frequency with which pyogenic organisms are found at the site of the lesions,⁴ and the gravity which their occurrence seem to lend to the prognosis, all point to the desirability of eliminating their occurrence.

We are just beginning to realize the meaning of medical asepsis; and let us hope to-day that the future will offer the medical man a degree of success comparable to that of the surgeon. It must first be proved whether the various bacteria found in the intestinal canal—especially the streptococci—are useful or useless.⁵ If they are useless, as we would believe naturally, and capable of harm, then to eliminate the pathogenic organisms, as nearly as possible, would surely be a step in advance. Certainly no one will say that that is entirely uncontrollable, for, up to the most recent times, have we ever tried?

When a perforation has occurred there is but one thing to do—operate. In giving these cases over to the surgeon, whenever such cases occur within my influence, I ask the surgeon one thing, and that is, unless the bowel is anchored to the abdominal wall, that the abdomen be not completely closed. In the cases which I have seen, whenever the abdomen was completely closed the patients invariably died.

Heart.—Four cases had murmurs on admission. Three were mitral systolic, one pulmonary systolic. The three mitral murmurs all disappeared in a short time. The pulmonary systolic murmur I heard three months after the patient left the hospital. Considering the history of the patient, I judge that it had existed for some time before the onset of typhoid fever. There was one case of severe endo- and pericarditis, in which a pure growth of typhoid bacilli was obtained in blood culture. In this case there was a clinical diagnosis also made of embolism of a mesentery artery, but this could not be confirmed, as a postmortem was not permitted.

Of the *blood pressure* in typhoid fever I have spoken before.⁶

Kidney.—Four hundred and twenty-seven cases. In this series, albumin and casts in the urine, at time of admission to the hospital, occurred as follows:

No albumin and no casts	43.54 per cent.
Thin ring of albumin and some hyaline or granular casts....	35.48 per cent.
Heavy ring or cloud of albumin, coarse granular casts, and red blood cells	20.96 per cent.

At the time of discharge of the recovered cases, there was one patient only in the entire series that showed albumin and casts, and one case that showed albumin without casts. In neither of these

cases could the patient tell that he did not have this condition before his attack of typhoid.

Considering the above figures, we see how well the kidneys seem to be able to recover their structure and function after the disease.

Phlebitis.—There were eleven cases of this complication. Six of these cases also had other complications that were due to mixed infections. How much mixed infections have to do with this complication is not definitely known, but it would seem that perhaps they do have some bearing.

Neuritis.—There were seven cases of this complication. In studying the association of complications in this series, I find that, in nearly all of the neuritis cases, delirium was a prominent feature during the height of the disease. This observation suggests that in some cases the nerve-cells and fibres are more than ordinarily susceptible to the typhoid toxin, or perhaps only that those cases have suffered a more virulent infection.

Abscesses occurred in thirty-eight cases. They were of three kinds, cutaneous, subcutaneous, and intramuscular (three cases). The cutaneous and subcutaneous varieties occurred mostly in those patients that were sick at home for some time before entering the hospital, and under unhygienic conditions were more or less neglected. These cases I also find were frequently associated with suppurative otitis media.

There were other complications, some of which I will merely mention.

Pregnancy, three cases, at three, four, and seven months, no abortions; one case of acetanilide poison, and one case of phenacetin poison, acquired previous to entrance of hospital; one case of appendicitis and rupture of a mesenteric gland; one case of typhoid mania; one case of post-typhoid insanity; one case of necrosis of skin and subcutaneous tissue on the anterior aspect of the thigh. This is a rare complication, I have seen three such cases and they were all fatal. It occurs as large areas of skin presenting the appearance of dry gangrene; these areas have a distinct line of demarcation and are independent of points of pressure. There were also one case of tetany, fatal; one case of bradycardia; one case of bradycardia and arrhythmia; and one case of recurrent apnœa.

In two cases of this series, tubercle bacilli were found in the sputum; we do not know whether these cases had tubercle bacilli in the sputum before the typhoid or not. One case of suppurative cholecystitis occurred; and two cases of severe headache throughout the attack. Typhoid state occurred in fourteen cases, six of which died.

Relapse.—One relapse occurred in forty-four cases; two relapses, in one case; and three relapses, in two cases. The total number of relapse cases was forty-seven.

Recrudescences—recurrences of temperature lasting less than seven days—occurred in seven cases.

TREATMENT

In considering the treatment of the disease, I shall refer to but one interesting phase, and that is the feeding of these patients. In one series of sixty cases food was withheld for a period of one to twelve days, the average number of days being seven.

The guiding points in these cases as to the length of time food was to be withheld were mostly the condition of the tongue, abdomen, mental symptoms, and general nutrition. The results of this investigation are seen in the following table, as compared with a series of cases treated by the same man under like conditions during the following year.

	FASTED CASES.	FED CASES.*
Number of cases	60	60
Days sick at home prior to entrance of hospital....	9.92	11.03
Days sick in hospital	32.16	30.19
Days sick altogether	42.08	41.22
Average number of days fasted	7.0	—
Sponges, first week (cases were sponged for 102½°)	4.56	5.9
Sponges, second week	0.75	.8
Sponges, third week	0.30	.45
Total number of sponges	5.61	7.15
Total number of relapses	4.0	8.0
Duration of relapses (days)	9.75	10.37
Diarrhoea cases	1.0	4.0
Hemorrhage cases	4.0	5.0
Perforation cases	0.0	2.0
Appendicitis and rupture of mesenteric gland.....	1.0	0.0
Deaths	6.0	7.0

* Broth twice daily, milk 3*vi* every fourth hour.

NATURE OF FATAL CASES.

FASTED CASES.	FED CASES.
One case cardiac action weak and meningeal irritation.	One case of meningitis.
One case of appendicitis and rupture of mesenteric gland.	Two cases of perforation.
One case of toxæmia.	One case of toxæmia.
One case hemorrhages, œdema of larynx, tracheotomy.	One case of meningitis.
One case of hemorrhage.	One case of hemorrhage.
One case of erysipelas.	One case of pneumonia and meningitis.

Glancing at this table as a whole, the figures at the side of the fasted cases seem considerably better. I have not drawn any conclusions from this table, but it is an interesting fact to consider. The tendency of to-day is toward feeding typhoids as much as they will bear throughout the course of the disease. This might be the proper treatment, but from what we can learn as yet it is by no means positively so. If liberal feeding is proper, we certainly must have a different form of diet for these patients from that which we used at that time.

I will admit that this series of fasted cases is small, and that, in a small series, mere coincidences weigh the balance toward one side or another. Yet it is true that in almost every way these judiciously fasted cases fared better than the fed cases, as can be seen in the height of the temperature, number of relapses, duration of relapses, diarrhoea, hemorrhage, perforations, and general mortality.

Whatever this table may not show, it does clearly show that judicious fasting of typhoid cases is safe. I also believe that the difference in the number of cases of relapse is not purely a coincidence.

If we utilize fasting as a therapeutic measure, in a sensible way, we will never need to use such drugs as turpentine internally nor in the form of stupes. And there is nothing that will improve the mentality of the patient so surely as fasting.

MORTALITY TABLE.

Nativity.	Deaths.		Total No. of cases.		Percentage of deaths.
	Male.	Female.	Male.	Female.	
Italy	11	0	83	1	13.09
Russia	16	2	86	21	16.81
America—White	12	6	74	53	14.13
America—Colored	3	0	17	7	12.50
Austria	13	2	67	27	15.9
Scotland, England, Ireland...	4	0	20	3	17.2
West Indies	2	0	2	0	100.
Japan	1	0	1	0	100.
Syria	1	0	3	1	33.
Germany	0	0	11	5	
Roumania-Galicia	0	0	5	1	
France	0	0	1	1	
Sweden	0	0	2	1	
Finland	0	0	2	0	
Corea	0	0	1	0	
Greece	0	0	2	0	
Switzerland	0	0	1	0	
Turkey	0	0	1	0	
	63	10	379	121	14.6
				500	

Mortality.—It will be seen that the general mortality of this series is 14.6 per cent. That, on the whole, this is higher than reports from other districts may be accounted for when we consider the vitality, social position, intelligence, hygiene, and many other characteristics of such patients, which would predispose to a low resistance, complications, etc., in a prolonged illness, such as typhoid fever.

In closing, I wish to express my sincerest thanks for the privilege of studying these cases with Dr. J. W. Boyce, Dr. M. C. Cameron, Dr. L. Litchfield, and Dr. Wm. H. Mercur.

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GRAVES'S DISEASE, RAYNAUD'S DISEASE, AND SOME OF THE ALLIED FORMS OF VASOMOTOR DIS- ORDER (VASOMOTOR ATAXIA)*

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GENTLEMEN: I invite your attention to-day to one of the most obscure subjects in clinical medicine, as well as in pathology. The obscurity depends, as in most of our medical problems, upon the fact that physiology has not yet given us the data necessary for its elucidation. We have numerous clinical observations, many pathological studies, and not a few fragmentary physiological investigations bearing upon it; but we still wait for the final co-ordinating discovery that shall harmonize apparent contradictions and reduce present complexities to a simple and understandable basis. There is reason to believe that it will be found through the study of those somewhat mysterious products of cell chemistry, the internal secretions—perhaps in that special group of substances known as hormones or exciting agents, through which one organ stimulates or restrains the activity of others, detoxicates the blood, or regulates, in some large or limited way, the nutritive and metabolic processes.

You are aware that within recent years much work has been done upon the physiology and pathology of the "ductless glands;" that, in especial, failures and perversions of the function of the thyroid gland have been connected with definite disorders of nutrition—cretinism and myxoedema—and with a certain definite syndrome or symptom-complex known variously as "Graves's disease," "Basedow's disease," or, from its two most striking features, "exophthalmic goitre." You know also that myxoedema and certain milder grades of disorder which exhibit some of the features of that affection, being attributed to failure of thyroid

* A clinical lecture at the Philadelphia Hospital.

secretion, are termed in general "hypothyroidism;" while Graves's disease and certain disorders akin thereto, but not exhibiting its complete picture, are attributed to excessive thyroid activity and termed "hyperthyroidism." This is but a small corner of the vast domain of the pathology of the internal secretions, and indeed but a portion of the field of perverted thyroidism. Yet even this is too large a topic to be handled in a single clinical lecture. I shall show you three cases, two of Graves's disease and another of an allied disorder, and shall point out certain features therein which lead me to doubt the current doctrine of their original and exclusive dependence upon thyroid disturbance. That they are associated with thyroid disturbance and that many of the later symptoms are thus to be explained is indubitable, and in various papers published during the last fifteen years I have given attention to that fact; but to me the principal element in these very various symptom-complexes is the vascular disorder that they manifest; and I am tempted to seek their proximal explanation in a failure of the cardiovascular regulatory mechanism. That the cause and intimate nature of this underlying failure in vaso-motor taxis is still to seek must be admitted. That some very close relation exists between the sympathetic, or, to use Gaskell's better term, the visceral, nervous system and the internal secretions, not alone of the thyroid gland, but also of the adrenal gland, the pituitary gland, and very probably the thymus gland and the parathyroid bodies, is evident. But in the present state of knowledge we are not justified in asserting that the thyroid disturbance is the starting point of the disorders under study, and especially we are not justified—and here I come to a highly practical question—in looking to surgery upon the thyroid gland as the only or the best method of treatment. When long-continued thyroid disorder has given rise to pronounced morbid changes in the gland, there may, indeed, be not only justification but urgent necessity for operative interference; either because of mechanical danger from pressure of the goitre upon the windpipe or upon the nerves and vessels, or because the excessive or perverted secretion of the diseased gland is giving rise to dangerous intoxication. This, however, is a late stage of the disorder, and, if I may reason from a moderately large personal experience, is one that ought not to

be allowed to develop. It can, I think, be prevented by the timely use of hygienic and medicinal measures—certainly it can so be prevented in more than the majority of cases. Mark, however, the significant word—*timely*.

I was once asked in a discussion to formulate the indications for surgery in Graves's disease; and ventured to reply that I knew but one—a *belated diagnosis*. Perhaps the statement is too sweeping, but at all events it summarizes my entire personal observation. I have seen no case, in which the disorder was recognized early, which progressed to a point necessitating or even suggesting surgical intervention; while I have seen many cases, far advanced, in which the diagnosis had not until then been made. I would not imply that this is always due to neglect or ignorance upon the part of medical men; on the contrary, the larger number of such patients had failed to consult physicians in time. In some instances, however, I must confess that the medical attendants had failed either to observe, or to realize, the significance of the phenomena distinctive of the disorder. This error is the more readily made in the incomplete cases, in those which lack one or more of the three cardinal symptoms—protrusion of the eyeballs, enlargement of the thyroid gland, acceleration of the cardiac rate. For we may have exophthalmic goitre not only without tachycardia, but without exophthalmos or without goitre, and sometimes without both.

If, therefore, the avoidance of surgery depends, as I have said, upon the timely use of appropriate non-surgical measures—and if this depends in turn upon the avoidance of a belated diagnosis—it follows that our principal concern is with the means of making a timely diagnosis. And just this is the importance of the conception of the disorder that I want to impress upon you; namely, that it is a variety of angioneurosis—a cardiovascular disturbance—an *ataxia* of the vasomotor system. And even if we grant—as I am not yet prepared to do—that this vasomotor instability in itself indicates thyroid intoxication, from excessive activity without hypertrophy of the gland, the lesson is no less important—the lesson, I mean, of the character of the symptoms significant for early diagnosis. For, so long as attention is concentrated upon the thyroid body, the frequent absence of goitre,

or even demonstrable thyroid enlargement, may lead one astray. On the other hand, when once we realize that the clue to a correct diagnosis is to be found in the vascular and neurotic phenomena, and become, in consequence, on the alert for their recognition, it is improbable that many cases will escape detection. Moreover, when we get into the habit of looking for certain signs which I shall point out, we find the cases to be much more common than the text-books might lead one to suppose. These early cases, the ones whose recognition is so important for the future welfare of the patient, are termed "incomplete" or "larval" cases—or, by the French, *formes frustres*. They are in the early stages frequently termed "indigestion," sometimes "nervous indigestion;" frequently "nervousness;" or perhaps "neurasthenia" or "hysteria"; not rarely "neuralgia," "malaria," "rheumatism," "biliaryness."

Sometimes, indeed, the visceral symptoms are so pronounced that a not unjustifiable diagnosis of inflammation or degenerative lesion is made—for example, appendicitis, gastric ulcer, nephritis. Cases simulating pretty closely the symptomatology of gall-stone or kidney-stone may occur, and give the physician as well as the patient great anxiety. I have myself counselled exploration or operation in order to remove doubt in one case of simulated hepatic colic and two cases of simulated appendicitis; and I may add that the sections, while negating the diagnosis of inflammation or calculus, at least permanently relieved otherwise intractable symptoms. Sometimes actual organic lesion, of the same kind as the commonly simulated affections, *e. g.*, gastric ulcer, appendicitis, nephritis, may develop in an angioneurotic subject, and such cases are doubly difficult. Displacements of organs (visceral ptoses) are not uncommon, and while these conditions have their own special symptomatology, relieved by appropriate, perhaps even surgical, treatment, they do not constitute the entire case.

With this general preliminary survey, you will now be prepared, I think, to appreciate the importance and significance of the special clinical phenomena exhibited by our patients.

CASE I.—GRAVES'S DISEASE: *Exophthalmos; Tachycardia; Tremor; Dermography, Factitious Urticaria; Tricolored Nails. No Goitre.*

I shall ask a member of the class to take a look at this man ¹ and tell me what is noteworthy in his appearance. Recapitulating the answers given we find that his pupils are dilated slightly and unequally, the left pupil more than the right. The irides respond to light but relax again in a moment, though not to the same extent as before; a similar tendency to exhaustion is shown in the response to accommodation. There is no paralysis of the face or of the limbs; but the fingers tremble when the hands are extended. The protruded tongue trembles. There is slight tremor of the eyelids when lightly closed.

Does the next member of the class notice anything more than we have been told in regard to the patient?

You must train yourselves to observe a patient closely. Sometimes a correct, though not complete, diagnosis can be made without asking a question. There are certain quacks who advertise their ability to do this—though whether their diagnoses are correct or not, nobody knows. And you are familiar with Mr. Sherlock Holmes's astonishing disclosures to his clients as to their vocations, their places of abode, their habits, their amusements, their states of married or single blessedness, etc., based upon observation of their faces, their hands, their clothing, their gait, and various tell-tale details of speech, manner, and the like. Now I do not wish my pupils to imitate the quacks—or even to emulate Mr. Sherlock Holmes. As a rule I do not believe in snapshot diagnosis; but I want to impress upon you the fact that in certain cases the physiognomy, or attitude of the patient, or something else which you can see at a glance, gives the clue to the case. Of course one must be careful not to form his opinion upon this sort of evidence only. We must go on in an orderly way and study the case thoroughly; and especially study those points which are against the opinion first suggested. A complete diagnosis involves a complete examination. This careful preliminary inspection, however, is an essential part of the complete examination.

¹ In lieu of the history and symptomatology of the patient, exhibited to the class through the courtesy of a colleague who will himself report the case, the author has here substituted facts taken from the case notes of a patient observed in private practice; preserving, however, the colloquial form of the lecture as reported stenographically.

Now can you tell me something from glancing at the patient? Yes, the eyes are staring; that is to say, the palpebral fissure is widened and the eyeball protrudes slightly. Exophthalmos, not great, but distinct, is present.

Now I will ask the patient to hold his head steady and follow this pencil with his eyes as I move it up and down in front of him. What do you notice? As the patient looks down, the distance between the cornea and the upper lid increases; that is to say, the descent of the lid is not instantaneous, but it lags for an instant behind the descent of the eyeball. This is known as Von Graefe's sign. You will sometimes find it when there is no apparent exophthalmos.

I ask the patient to keep looking at my pencil and, holding it centrally, approach it towards his nose to test the convergence of his eyes. You observe that the eyes converge very well until the pencil almost touches the face, and then the power of convergence seems to give way suddenly and the eyeball, as shown by the position of the pupil, shoots towards the outer canthus—there is lack of power of convergence, sometimes called "Moebius's sign." As we continue to watch this man's eyes we notice that winking is infrequent. He winks once or twice and then stops for an appreciable time. That is known as Stellwag's sign. Stellwag's name is also attached to the permanent retraction of the upper lid which is sometimes observed. This retraction may be unilateral and such cases are not so uncommon as was at one time supposed.

We have already noticed the tremor of the hands, but we will now look at it a little more particularly. There are two motions, a coarse tremor and a fine tremor; the coarse tremor increases with attention and fatigue. The finer motion of the fingers can be seen only by those of us who are quite close to the patient. As it increases with time and concentration of attention we note that he winks more frequently; or if we tell him to close his eyelids lightly they become more distinctly tremulous. That tremulousness of the eyelids, which disappears if the eyes are tightly shut, is often an early sign, appearing long before exophthalmos or goitre can be detected. I shall ask the patient to wrinkle his forehead, wrinkle it upward. This he seems to be able to do. Sometimes the wrinkling of the forehead is very difficult or even

impossible. I have seen the sign of Moebius, which this patient exhibits, occur unilaterally.

I now am going to try to develop another sign, to which I think I was the first to call attention, in so far as it relates to Graves's disease. It occurs in other conditions and has therefore only a confirmatory value. First, you observe that as the man's chest is exposed to the somewhat cool air there develops gooseflesh and that this passes off and recurs. If I touch him anywhere you can see that the gooseflesh increases, and especially if I draw my hand down along his spine you see that after an interval of some seconds a wave of gooseflesh, as it were, begins along the shoulders and travels down the chest. This is the so-called pilo-motor reflex and in this particular patient it is very well developed. Now I am writing with a silver probe upon his skin; I use the slightest possible pressure. You see after a slight interval that the letters which I have traced upon the chest appear, first in white, and afterward in red lines. This phenomenon we term "dermographism"—skin writing. The details of its phenomena differ in different cases. The lines may be white only or red only or both red and white, as here. The red lines then become bordered on each side by broad white lines. Running the finger over these red markings we find that they are becoming somewhat elevated above the skin, and at the same time paler in color. In some cases the elevations are much more marked than these. They are veritable wheals, artificial hives, technically called "factitious urticaria." Sometimes the gooseflesh reflex is exhibited along the tracings of the probe, and only there. As this writing has faded out slightly I will apply over it a towel wrung out of hot water. It becomes brighter and more distinct. In some cases cold water will bring it out even better. The reactions to hot and cold water differ in different cases. In some cases both will make the dermatography more distinct; in some cases one will diminish, the other increase it. In still other cases one or the other will cause a diffuse red flush in which the distinct outlines of the tracing are lost. These variations have certain minor diagnostic significance, but I cannot enter upon this to-day. I shall ask the class, however, to point out the general significance of the phenomenon. I am answered: "A vasomotor disturbance." That is correct. It shows

that transient paresis or stimulation of the peripheral capillary vessels is very easily brought about. Excessive pressure, as from the knout of Russian tyranny or the whip of a Delaware sheriff, produces red streaks and wheals upon a normal back. This redness indicates an excessive distention of the capillary vessels. Slight pressure produces a temporary dilatation, active or passive as may be, of the terminal vessels of the skin, and therefore redness follows the line of pressure.

This ready yielding of the peripheral vessels to slight pressure indicates a condition of low vasomotor tonus. This is the basic factor underlying this man's disorder. It is not a disease but a constitutional, frequently congenital, defect. Dermographism may be found in individuals who are in all other respects normal and who may not develop Graves's disease or other special syndromes of vasomotor origin during the whole of their lives; yet it is in itself a slight departure from normality. It cannot be obtained in every person, but only in a certain number—I have not attempted to keep statistics but should say approximately about 1 in 10. It is more common in some races of men than others, being notably frequent, as is the whole train of vasomotor symptoms, among Russian Jews—a circumstance probably to be attributed to the environment of anxiety and uncertainty in which they and their ancestors have so long lived. It is also more common among artists—musicians, actors, painters, sculptors, poets, orators—and others of mobile temperament. It is not the occupation which causes it, but the temperament which it signifies that leads to the choice of occupation. It is one of a number of signs of this temperament or this constitution, or this condition of vasomotor lability; which in itself, let me repeat, is not a disorder but which offers a basis upon which disorder or organic affection may develop. I shall return to this phase of our subject later. Let us look again at our patient.

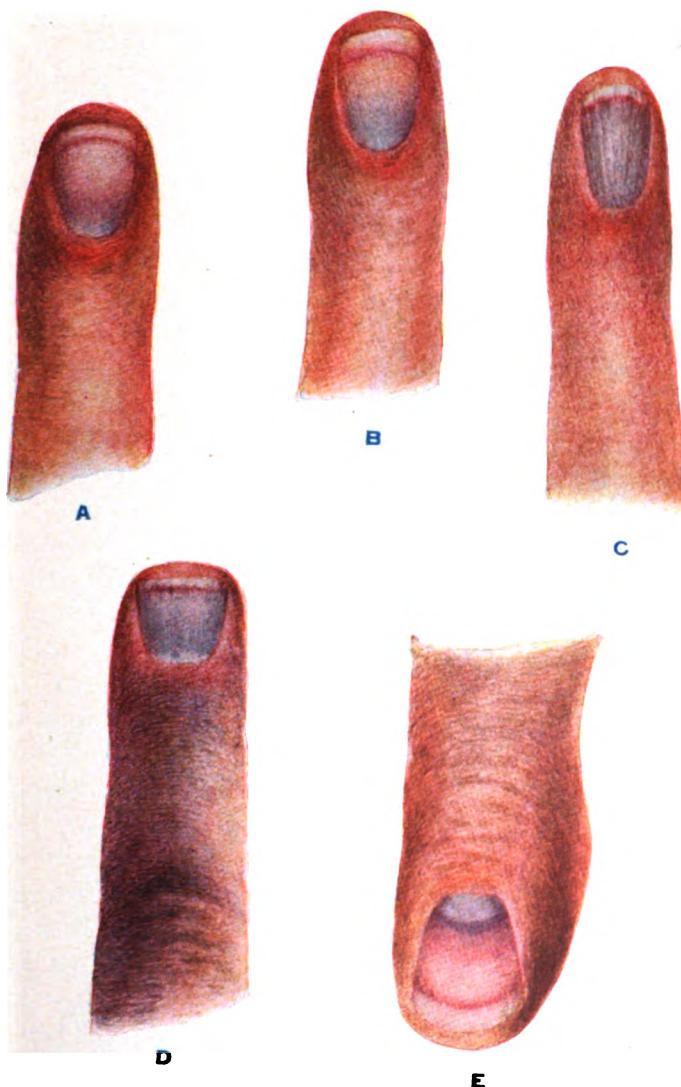
Notice that his face is flushed, that his ears are red. The room is not unduly warm and none of us here in the ring with the patient are flushed. This apparently causeless blushing is frequently a marked symptom of vasomotor ataxia. Sometimes it is unilateral, though it may occur upon either side. Sometimes it is quite localized. It may be transient and then either fleeting

or quite persistent, of rare or of very frequent recurrence, or it may be permanent. In one of my patients the permanent blush, or erythema, as it might be called, was limited to an oval patch about two inches long just above the angle of the left jaw. Sometimes only the ears, or one ear "burns." Like all the other signs it differs much in degree and extent not only in different patients, but in the same patient at different times; and like all the other signs it differs from the normal, not in its character, but in its occurrence; that is to say, it results from causes which are not of the kind or degree to produce the same effect in normal persons.

What other symptom should we look for? Tachycardia, that is correct. The pulse rate I see from the chart varies. It has been as high as 108. It is now, under rest and medication, below 95; varying from 85 to 92. When the patient remains quiet he is not conscious of palpation, but under excitement or exertion he feels a thumping in the chest with a sense of smothering. Percussion and auscultation show no heart lesion. The first sound is somewhat lacking in muscular tone. The pulse is full, equable, of low tension; systolic pressure is 100; diastolic pressure 80.

What else should we look for? An enlarged thyroid gland. How shall we look for an enlarged thyroid gland? "By inspection." Looking at the neck in front and from the sides we fail to observe any abnormal fulness. Sometimes fulness which is not manifest in one position becomes evident in another. We allow the patient to sit erect; to lie down with the head unsupported by pillowing; and we prop the head and neck at various angles. Still there is nothing to be seen indicating enlargement of the thyroid gland. There is no evident goitre. What next? "Palpation." Upon ordinary palpation we do not find any enlargement of the thyroid gland. I will now straddle the trachea with two fingers and tell the patient to swallow. As he swallows I feel the isthmus of the thyroid gland move up and down between my fingers and I should say that it is very slightly, if at all, enlarged. I have frequently found that amount of enlargement without any symptoms of thyroid intoxication. There is little, if any, goitre and only slight and occasional acceleration of the heart, but there is slight exophthalmos and with it those other phenomena to which I have called attention.

PLATE II.



Different types of color changes in fingers and nails in vasomotor ataxia. *A, B, C*, curved nails, thickened red skin; *A*, three color zones; *B*, two color zones; *C*, ridged blue nail; *D*, flat blue nail, purple finger; *E*, typical "red, white, and blue" nail. All show the terminal red line.

Now let us look at his hands once more. What do you observe? They are congested, cyanotic. We notice around the borders of the nails (Plate I, *A*, see frontispiece) that the skin is of a brick-red color; the nails are purplish or blue at the base; then in the middle we notice a pinkish-white area, and towards the end of the nail a rather sharp and narrow curved line, convex toward the tip, of somewhat brighter red. So we have red, white, and blue—tricolored nails. This also is a sign to which I called attention many years ago. I think you can see it from the benches as the man passes around the ring. The narrow bright red line near the tip of the nail, then a broad pinkish—by contrast almost whitish—area, and then the deep purple (or blue, as it sometimes is) at the very root of the nail. These colors differ somewhat in tint or extent in different patients (Plate II), in the same patient at different times, sometimes in different nails on the same hand. The distal line may be somewhat broader and deeper in tint than this, but it is always red—it is a loop, of course, of distended vessels in the nailbed, and becomes evident where the pressure of the nail is removed. The middle area may be yellowish, pinkish, or whitish; the proximal area deep red, purple of various shades, blue, or, as in one case I shall show you, almost black. Sometimes the whitish area is wanting and the colors are blue and red; sometimes the blue is wanting. Sometimes the nail is very flat and of deep or light leaden color. Like dermography, the tricolored nail, in some of its minor degrees—or more frequently a light pink nail with the distal bright red line—is not so uncommon as I at first thought. But in its full and sharp development it indicates vasomotor ataxia. As I hold up one hand and arm of this patient, you see that the color slowly runs out, leaving what we usually term a white—that is, a normally colored—hand (Plate I, *B*). I will make slight compression upon the vessels of the wrist with a bandage, and then put this hand down beside the other. You notice the great contrast in color. Now as I loosen the bandage and allow the blood to return to the hand, it first becomes pink, then mottled, now purple, and finally it will become as cyanotic as the other. These illustrations (Plates I and II) show a change similar to those in the hand of a patient whom I will show you later, the one with "black" nails. What does that indicate as regards the blood-vessels? The

blood, when allowed to return, comes first to the arteries and capillaries and gives the pink color because the terminal capillaries are dilated; then the mottling and the purple follow, as the blood runs into the dilated terminal veins; and finally the deep blue, as the venous congestion increases and masks the capillary congestion. So we notice that we have dilatation of both systems of peripheral vessels. Observe that when I stroke the hand the discoloration disappears; when I cease stroking the colors return in the same order as before. Notice also that if I press with my thumb on the back of his hand the whitish impression persists for quite a while. That is one way to make out slight degrees of passive congestion. You see that if I press upon his face the finger marks remain. When I press my hand upon his chest it is as if white paint were upon my fingers and the impression persists for many seconds. And so I might go on in many ways to emphasize the peripheral dilatation, but I wish to call your attention to certain other phenomena for which other patients must be exhibited. Although this man has no goitre, and although exophthalmos is slight and tachycardia is not prominent, the case is unquestionably one of Graves's disease, and I have shown you the prominence of tremor and of vascular paresis in its symptomatology. In connection with this tremor, the theory of parathyroid deficiency as a causal factor is quite attractive; and in one of my patients treatment with parathyroid substance did cause the tremor to subside. So also treatment with calcium salts is sometimes useful, symptomatically; but as yet we do not know enough to draw any definite conclusion from such facts.

The next case is one who was in my service at Jefferson Hospital, and whom I exhibited to the class last year.

CASE II.—GRAVES'S DISEASE: Persistent Headache the Chief Symptom.—Mrs. W., aged about 45 years, was referred from the ophthalmic clinic of my friend and colleague Prof. Howard F. Hansell. She has suffered much of many oculists chiefly in the way of prisms and muscle-operations. For "as long as she can remember," she has had recurrent headaches; not strictly migraineous in type, as there is no nausea or vomiting; nor have the attacks shown any distinct relation to the menstrual period. The pain may be unilateral or bilateral, frontal or occipital, but is always accompanied by sharp stabbing pain referred to the eyeball. Dr.

Hansell found only dilatation of the vessels, and a refractive error, which he has corrected; and he did not believe the pain to be of ocular origin. We found the heart to be irregular, at times tumultuous, in its action. The systolic pulse tension was low, 100 to 110 millimetres of mercury; the diastolic pressure about 80 millimetres. The sphygmographic tracing was very irregular, showing a lack of sustained pressure either in the heart or vessels. The first sound lacked muscular tone, the second sound was weak and irregular, the pulmonic sound being sharper than the aortic; but we could detect no murmur. Precordial dulness was increased to the right. The apex beat was not visible and scarcely palpable. The patient has a slight enlargement of the thyroid gland, and exhibits dermographism and tricolored nails. The eyes, on fixation and elevation of the eyebrows, show a distinct rim of sclera above the cornea. The patient was put at rest and cactus administered in increasing doses, in the form of a solid extract termed by the manufacturer "cactin." The tracings which I exhibit show a gradual betterment of the heart's action, slight under rest, marked under drug influence, and now maintained for a month under activity. The pressure is now 125 systolic, 90 diastolic. The patient tells us that her pain has disappeared, and the date of her improvement coincides with the date of the marked change in the sphygmogram.

Now here is a case in which antipyrine, phenacetin, etc., which the patient has received from time to time for years, gave only temporary relief, and at last failed utterly. Indeed I am of the opinion that they made her worse. Treatment directed to the improvement of vasomotor tone—for that is the effect of cactus—has been of distinct benefit. Ergot or barium chloride might have been equally useful. I did not use digitalis or strophanthus, which would also have been useful, lest the result I hoped to reach might be attributed to the relief of congestion dependent upon cardiac dilatation. I do not find that cactus alone is an efficient remedy for the cardiac arrhythmia dependent upon muscular asthenia or dilatation from any other cause.

I have already said that I am unable to accept the view that hyperthyroidism is the fundamental difficulty in Graves's syndrome. Hyperthyroidism is a complication which in some cases ensues after the thyroid has become affected and hyperactive as the result of the original disorder or toxæmia, whatever that may be. You

have just seen a case in which there is but slight tachycardia and inconsiderable thyroid enlargement, yet the exophthalmos is there, the tremor is there, and the general relaxation of vessels is present. What seems to be the fundamental condition? Evidently the vasomotor failure. As to causation of this I am not now putting forth any theory. To the condition I have given the name of vasomotor ataxia, and it manifests itself in various ways. It appears sometimes in a syndrome the very opposite of that which we have just had before us in different degrees. In those cases abnormal relaxation was evident. Its opposite is contraction. We see this highly marked in a fully developed case of Raynaud's disease, in which there occur, usually on the hands, sometimes on the feet, often in the nose or ears, occasionally over the whole body, paroxysmal blanchings or discolorations. As a rule, but not invariably, this "local syncope" or "local asphyxia" is symmetrical. In severe instances gangrene follows, hence the name "symmetrical gangrene," sometimes applied. The fingers may first tingle, then become numb and white, and the name "dead finger" has thus been given to one of the numerous manifestations of Raynaud's syndrome. "Paroxysmal haemoglobinuria" is another of its names, from the appearance in certain cases of large quantities of haemoglobin with few or shadowy blood-cells in the urine. Now I am not systematizing or exhausting the symptomatology of this vasomotor spasm—merely illustrating its protean character. Exposure to cold is not infrequently the immediate determining cause of a paroxysm. It is not the cold, but the susceptibility to such extreme reaction from moderate chilling, that interests us. The phenomena of Graves's disease resemble in a measure the normal reactions to excessive heat; Raynaud's phenomena resemble the normal reactions to excessive cold; and both Graves's disease and Raynaud's disease exhibit some of the phenomena of severe fright. But the question is, why do some individuals show these symptoms under inadequate provocation? I have seen many cases, and published a few, in which symptoms of Raynaud's disease and of Graves's disease co-existed. In this connection the patient I now show is extremely instructive.

CASE III.—Pseudo Angina; Paroxysmal Tachycardia; (Larval) Graves's Phenomena; Acro-asphyxia; Acroparesthesia.—Mr. L. A., aged 26 years, a travelling salesman, is a private patient

and has been under my observation since he was five years of age. Of the diseases of childhood he has had measles, whooping-cough, and mumps. His father died of pulmonary tuberculosis after an illness lasting fifteen years, to which attention was first directed by pulmonary hemorrhage, and from which I believe recovery would have taken place had the patient been able to carry out more fully the advice given him concerning open-air work and a general hygienic life. His mother, who is living and well, is one of a highly neurotic family. He has one sister, who is healthy but who had, as a child, a rather marked case of chorea. Among his collateral relatives there have been many cases of hysteria and of chorea, and at least two of prolonged diabetes mellitus. At the age of fourteen this patient showed signs of tuberculous infiltration at the left apex. He was sent to the Adirondacks, where he remained for two years, returning home apparently perfectly well, and since then has given no sign of active pulmonary tuberculosis. He is six feet high and weighs 160 pounds. He has an expansion of four inches. At the age of eighteen he contracted specific urethritis from which he apparently recovered completely. After this he was well until about two years ago, when he began to have occasional "faint spells," which appear from the description to have been transient attacks of subjective vertigo. He was at that time living in a distant city and I cannot speak from personal observation. The present series of attacks began about six months ago.

He tells us that he has "a pain in the heart," at times very severe, which comes on suddenly and passes away quickly. When I ask him to indicate the locality he places his hand in the third interspace to the left of the sternum, at about the parasternal line. There is no tenderness upon pressure at this point. The attacks of precordial pain, we find upon further questioning, may occur several times in a day, or may occur only once or twice in a month. There is no regularity. They are much more apt to come on after excitement of any kind, pleasurable or the opposite; fright especially is likely to cause them. They are sometimes followed by a sense of faintness, but never by actual syncope; there may be dizziness, though this is not common. There is no radiation of pain, no sense of constriction in the throat or elsewhere, no dyspnoea. The pain is sharp, stabbing, and not accompanied by a sen-

sation of crushing. Sometimes the attack is followed immediately, or after an interval varying from a few minutes to half an hour, by violent palpitation of the heart, which may be so great that the patient has to stop, if he is walking, and sit down somewhere until the paroxysm subsides. At other times there may be a paroxysm of cardiac palpitation without the precordial pain. We cannot get any clear account of circumstances precipitating the attacks either of pain or of palpitation, beyond their coincidence with emotional excitement, as already stated. They may occur in the absence of such emotion; they occur when hurrying and when resting; after a meal and when the stomach is empty; and apparently independently of the occasional attacks of indigestion of which he complains. He cannot give us any idea of the duration of the attack of palpitation, or, as I shall now call it—for such it evidently is—the attack of paroxysmal tachycardia. As to the rapidity of the pulse-rate, its volume, and its pressure during the attacks, I have no information, as I have never been fortunate enough to see him in one. The pulse characteristics may be very different at different interviews. My notes show nothing of this variability in his previous history.

Sometimes I find the pressure elevated perhaps to 145 or 150 millimetres of mercury systolic pressure, with 100 or 120 millimetres of mercury diastolic pressure; at other times the systolic pressure is as low as 110 and the diastolic pressure perhaps 70 or 80. Usually the volume of the pulse is full and the artery is easily compressible, yet there is a suspicious hardness of the vessel at times, even at periods of low pressure. As a rule the pulse is regular, but the rate may be, on different occasions, anywhere from 60 to 90 beats to the minute. The area of precordial dulness is not usually enlarged; but may perhaps be a trifle greater to the right—I speak with caution—sometimes, during a period of low pressure and rapid rate. The apex beat is normally situated and at present is somewhat increased in force, while there is a faint, soft, blowing systolic murmur just above the apex, not transmitted. This is not constant. To-day, the first sound is lacking in muscular tone; the pulmonic second sound is about normal in character; the aortic second sound is heightened. These findings correspond with a pulse-rate of 72 and a systolic blood-pressure of 140, the artery being full and somewhat hard.

In December of last year (1908) the patient noticed for the first time that when he became cold his nails turned blue. I have a memorandum that at that time he stated that otherwise his hands would sweat; that the nails, when I saw them, were pinkish with a red line at the tip; and that the half moon was clearly to be seen, though a little dusky. The eyes showed a rim of sclera above the cornea on voluntary wide opening when the balls were fixed by looking at a stationary object. There was no lagging of the lids and no tremor; no tremor of the hands was seen, no lesion of the heart detected. While the blueness of the nails occurred upon exposure to cold, the patient stated that he felt "generally bad" in a hot or close room. A month later, January 4, 1909, he reported that the hands became cold and the nails black for ten or fifteen minutes every morning as soon as he got out of doors or upon washing in cold water. He was therefore using hot water for his ablutions. The discoloration passed away gradually. He had noticed it to be greatest upon the left side and most marked in the little finger and second finger upon both sides. Occasional tingling and numbness was felt in both hands, chiefly in the ulnar distribution. The paraesthesia was independent of the local asphyxia, of temperature, or of emotion, and could not be attributed to pressure at the "crazy bone," although usually most marked in the morning and relieved by motion and friction. The color phenomena had disappeared when I saw him, and he was requested to come in sometime when they should be present, which he accordingly did on January 25, 1909. The illustrations show the condition of the nails at that time. The hands were mottled, the color slowly running out upon elevation; the nails were dark, with three distinct areas of different color—dusky blue, almost slate-color at the root, deep red just below the tip, and in the middle dusky pink. Immersion in cold water intensified the lividity, while immersion in hot water caused the hands and nails to become bright pink, which color could be temporarily stroked out or pressed out, and slowly disappeared as the heat passed away. Under treatment this condition has slightly improved, but the patient tells me to-day (April 13), that yesterday, being disturbed by bad news—the sudden death of a business associate—he had a chill and the nails became intensely black for a few minutes. This has passed away, although we can now note three areas, deep red at the tip,

purple at the base, with a lighter area between; but by no means so marked as in the illustration. The hands are warm and of normal color, but upon asking him to open the eyes widely we note a considerable margin of sclera both above and below the cornea; in other words, we have the picture of an apparent exophthalmos; apparent only, however, because with the cessation of the voluntary effort of opening, the eyes resume a normal appearance in this respect. We note, however, that the pupils are much and equally dilated. There is prompt response to light but with quick exhaustion; a similar promptness and quick exhaustion marks the response to accommodation. After wide opening, if we make the Von Graefe test we find that the upper lids do not lag as the eyeballs descend; but there is a sign to which I have frequently called attention, a sticking, hitching, or interrupted descent of the lids. When lightly closed, the lids show a fine tremor. There is a fine tremor of the hands upon extension. The thyroid gland is not enlarged, though it is easily palpable. Dermographism in this patient exhibits a peculiar modification. Thus a probe drawn across the cheek leaves behind it a deep crimson streak. This fades away and is followed by a wider white streak. In other words pressure has caused dilatation, followed by quick contraction of the vessels. I may add that examination of the eye-ground by Dr. Hansell shows distinct dilatation and engorgement of both veins and arteries.

Here, then, we have a patient who exhibits, in larval form, unmistakable phenomena of Graves's disease; who has definite acro-asphyxia, acroparesthesia; with attacks of pseudo-angina and of paroxysmal tachycardia. Is it the more scientific to make four separate diagnoses in his case—each merely a syndrome name—or to include all the phenomena under one comprehensive term, suggestive at least of a definite pathologic physiology, vasomotor ataxia? And observe, also, that in this patient we have the signs of Graves's disease without the goitre and without evident or persistent hyperthyroidism. That in future we may have goitre and hyperthyroidism or persistent tachycardia is possible, though of course we shall do our best to prevent the full development of the syndrome. On the other hand it is possible that the Raynaud syndrome may become more pronounced; and, should this be the case, it is quite possible that

arteriosclerosis and even evidences of neuritis, especially in the ulnar nerve, might be discovered years hence, at autopsy. But none of these developments of either extreme, Graves's or Raynaud's, would alter the fact that in the beginning the disorder depended upon a congenital instability of the vasomotor system, and that the particular phenomena developed are to be attributed to accidents of environment or of toxæmia.

You have heard that this man's father had pulmonary tuberculosis and that he himself has recovered from the same affection.

Dilatation of the pupils and low pulse-tension are not uncommon in tuberculosis. I believe them to be important signs of the "susceptibility" to this form of infection. Others may regard them as evidences of existing infection and toxæmia. This opens for discussion a wide field which we have not time to enter now; but whenever you observe these signs make a careful study for possible tuberculosis.

Other disorders frequently associated with signs of imperfect vascular co-ordination are the metabolic perversions, especially gout and diabetes; not rarely arthritism—rheumatism or arthritis deformans. Additional manifestations of vasomotor ataxia are migraine, urticaria, asthma, and hay fever. Hemorrhages are not rare; epistaxis, haemoptysis, haematemesis, melæna, purpura, haematuria. Often the blood is occult. Some patients show a curious "marbling" or mottling of the skin in general, though rarely of the face. It may be permanent, or developed on exposure to air, sometimes only appearing in cold weather. In one of my cases the appearance was of red, white, and blue geometrical designs, almost like a "tattooed" man. In most instances some permanent vascular abnormalities of the skin can be detected on careful search, frequently on very casual observation. These may occupy the face, the trunk, or the extremities. They vary from minute red or blue spots, scarcely more than petechiae, to large or small angioma or telangiectases. Their occurrence indicates the constitutional vascular peculiarity upon which the very various symptomatology of this interesting group of disorders is builded.

I have by no means exhausted the subject, merely introduced it. I should like to talk to you of treatment, but our hour is up and I can only be brief and general. You have gathered at least that I do not favor surgery in exophthalmic goitre except as

a last resort. In the various conditions of vasomotor disorder, the internal secretions as represented by thyroid, parathyroid, thymus, adrenal, and ovarian preparations—aided by some such drugs as the calcium salts, the barium salts, picrotoxin, ergot, digitalis, strophanthus, cactus, aconite, veratrum, the nitrites, hyoscine, atropine, asafoetida, musk, sumbul, valerian, camphor, and strontium bromide—are to be used, choice being made among these various agents according to the particular group of symptoms that is to be dealt with. Sodium sulphocyanide is sometimes useful—a suggestion I owe to Paulli's studies of ionic pharmacology; and I have lately used with apparent good result in cases marked by a tendency to hypertension, a preparation modeled upon thiosinamin, but with the addition of bismuth to render it more acceptable to the stomach, which Dr. Frederic S. Mason, who has prepared it for me, characterizes as allyl-sulph-carbamide-bismuth-diiodide. Diet is to be carefully regulated; and, as it is quite possible that absorption of toxins from the intestine may precipitate the crises or maintain the established disorder, digestive ferments, lavage, purgatives, intestinal antiseptics, find place. In some cases rest, in others regulated exercise, is indicated. Perhaps the most important of all measures in mild and early cases is the education of the vascular responses by mild thermic stimulation—some appropriate form of "water-treatment"—as the alternating hot and cold douche, or simple sponging with hot water followed by a brisk rub with cold water. The details must be carefully prescribed and modified according to the conditions and the result in the individual case. But I cannot elaborate further. I have chiefly wished to impress upon you the importance of systematic interrogation of the vasomotor system as well as of the other organs and systems before formulating a diagnosis in any case.

The examination of the chest or the eyes or the urine does not imply that the individual patient has thoracic, ophthalmic, or renal abnormality; yet such examinations are always necessary, if only for exclusion. So with the vasomotor system, now neglected unless it obtrudes itself. Its disorders, when systematically sought for, will prove to be more common than is supposed, and their development into distressing and often fatal disorders will be prevented by timely discovery and appropriate treatment.

GONOCOCCIC SEPTICÆMIA

BY G. DIEULAFOY, M.D.

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ON the 9th of February last there came to our wards at the Hôtel-Dieu a young man of 23, who said that he had been ill for about a week; the symptoms had been headache, high fever, and continual diarrhoea. This condition, combined with his general aspect, at once made us think of typhoid fever, and on examination rose spots were seen on the abdomen, the spleen was found to be enlarged, and the temperature was over 39° C.

But the following morning the patient's condition was better; the night had not been bad, his symptoms had improved, and the temperature was only 37.7° C., although no antithermic drug had been administered.

This apparent improvement on the ninth day of the illness, however, was not sufficient reason for our changing our diagnosis. A temporary remission of this sort, of one and a half to two degrees, and even more, and lasting from twelve to twenty-four hours, is classical; it was first studied in Germany by Wunderlich, and in France by Jaccoud. The former thought that it occurred on the seventh day, but Jaccoud showed that this is not obligatory, and that the momentary improvement may take place either a little earlier or a little later. In any case, the remission with our patient was immediately followed by a sudden rise in temperature, the thermometer exceeding 40° C. twenty-four hours later.

There was one symptom which in our patient assumed unusual proportions from the outset—I refer to his perspiration; this was so profuse that it was necessary to change his linen several times during both day and night. This feature brought to mind the variety known as sweating typhoid, and yet the present case did not resemble this disorder; on the other hand, such profuse perspiration is very abnormal in ordinary typhoid.

Two days after the patient's arrival in our wards a murmur of mitral endocarditis was detected, and this murmur seemed to

present the scraping, almost musical tone sometimes observed in ulcerating endocarditis. It should be remarked that this man had never had an attack of rheumatism.

The appearance of this endocarditis with its special tone, combined with the profuse perspiration above mentioned, caused us to reflect; however frequent endocarditis may be during inflammatory rheumatism and certain infectious disorders, it is altogether rare during an attack of typhoid fever. We therefore commenced to question our diagnosis and made a Widal test.

This was done on February 15, on the fifteenth day of the disease, under the most favorable conditions, with a culture only twenty-four hours old, and proved quite negative both at $1/50$ and $1/50$; repeated the following day under the same conditions it was again negative at $1/50$, $1/50$, and $1/10$. This result seemed to show that the case was not one of typhoid, but that we must look elsewhere for the cause of this infectious disorder that was simulating enteric fever.

On examining the patient more completely we finally found a trace of discharge at the meatus. There was no real flow, nor were there any spots on the linen; but on cross-questioning the man he told us that a month previously he had had gonorrhœa, but that the discharge had suddenly stopped at the beginning of the present feverish condition. Bacteriological examination of the discharge revealed the gonococcus.

It was then possible to suppose that the case was one of gonococcal infection. I do not refer to a local infection, such as epididymitis, of which there was no trace, but to a general infection, a gonococcal septicæmia of a typhoid form.

It is true that articular manifestations are the ordinary symptom of gonococcal septicæmia, and that with this man no joint had been affected in the slightest degree; but in spite of this fact the diagnosis of gonococcal septicæmia seemed the most probable one, and a specimen of the patient's blood was taken to be tested. Thirty hours later the cultures on peptonized ascites-bouillon had developed, and examination showed that they were pure growths of gonococci.

On February 19 a fresh serum-diagnosis was made and proved absolutely negative not only for typhoid at $1/50$, $1/100$, $1/200$, $1/500$,

$\frac{1}{400}$, and $\frac{1}{500}$, but also with the paratyphoid *A* and *B*, with their partner, the paracolon bacillus, and with the colon bacillus. Two days later a fresh culture from the blood was made as above, with results identically the same: presence of numerous gonococci, total absence of all bacilli. The patient's urine was also analyzed and was found to contain no albumin and to be otherwise that of an ordinary case of pyrexia.

These frequent and various laboratory tests may occasion some surprise; but as will be shown later on they were not a superfluous luxury.

We were, therefore, at last in possession of the true diagnosis; the case was neither one of typhoid nor of paratyphoid, but was a typhoid form of gonococcic septicæmia. Examination of the blood furnished the following results: red blood-corpuscles, 7,100,000; this increase in red globules was evidently due to serum abstraction produced by the diarrhœa and perspiration. The haemoglobin was only 0.42, less than half of the normal. The white blood-corpuscles were 16,000. A differential count showed the following proportion of cells: polynuclears, 71 per cent.; lymphocytes, 18 per cent.; large mononuclears, 10 per cent.; eosinophiles, 1 per cent.

The treatment employed up to that time—cold baths, quinine, sparteine, caffeine, and milk—had produced no result; although the urine was abundant and without albumin, the situation was growing steadily worse. The eruption noted during the first days could no longer be called rose spots; a certain number of elements were actual papulae, reddish and prominent. The pulse was 120, temperature 40.6° C., tongue dry, perspiration still profuse, diarrhœa intense, the endocarditis murmur still scraping, and prostration marked, when new symptoms set in and the patient began to cough, his breathing became short, and physical signs soon revealed an attack of double bronchopneumonia, particularly marked on the left side, that grew worse during the following days. Coughing was incessant, and the expectoration mucopurulent and extremely abundant. This was not at all the clinical picture of lobar pneumonia, and, on the other hand, there were no reasons for suspecting pulmonary embolus. There could be no doubt that it was bilateral bronchopneumonia with its very grave prognosis. This lung manifestation also proved to be a localization of the

gonococcus infection, as sputum examination revealed the gonococcus combined with the pneumococcus.

The fever, prostration, shortness of breath, perspiration, and diarrhoea showed no improvement, the patient was slightly out of his mind, and for several days his state seemed past hope. In order to endeavor to counteract this gonococcus infection, I should have liked to use a gonococcus vaccine, but there was none to be had. I sent to London for the vaccine prepared according to Wright's method, but it was a long time in reaching us; nevertheless, on February 25 a first injection was made with 1 c.c. containing five million of gonococci. As soon as the vaccine treatment was begun the results shown by the opsonic index were carefully noted; but this side of the question, as well as the effect of the vaccine treatment, I shall have to reserve for another time.

At the moment when the first injection was made the temperature had begun to break; but there were as yet no signs of improvement in the patient's general condition, and the outlook was extremely grave. The day after the injection the patient's state was considerably better. Whether this improvement was due to the vaccine it is not possible to say; however, from that time on, whether or not it was a mere coincidence, the man's condition improved steadily, and the various symptoms gradually decreased in intensity.

A second injection of vaccine, containing five million gonococci, was made three days after the first. This time improvement was striking, the temperature went steadily down, and the dyspnoea and physical chest signs disappeared, leaving only a certain amount of pleural rubbing on both sides. Auscultation of the heart showed that the timbre of the murmur had changed; instead of being rough and loud, it was now much softer, as is seen in a mild case of rheumatic endocarditis. The patient felt much better and was not averse to talking; perspiration had not completely disappeared, but the diarrhoea had ceased.

The third injection, containing ten million gonococci, was made four days after the second. Convalescence was then at hand, the pulse was at 76, breathing normal, and, the patient being hungry, his diet was increased. During the following days the man became fully convalescent and could be said to have recovered

from this extremely serious gonococcus septicæmia, which had lasted about forty days.

It should be known that any patient with gonorrhœa, however simple the attack, may be seized at any moment with this form of septicæmia; the gonococcus enters the veins and the infection passes from a local to a general one. For this to happen it is not even necessary that the attack should be in full activity; a patient who feels safe because he is toward the end of his attack of gonorrhœa may be suddenly seized with septicæmia that in many cases will carry him off. The possibility of such disasters should be well known. Gonorrhœa is not only a local infection that may give rise to epididymitis or salpingitis, but once the gonococcus reaches the vessels it may be the origin of a variety of very serious conditions: acute and chronic arthritis, ulcerous endocarditis, pericarditis, bronchopneumonia, pulmonary embolus, peritonitis, pleurisy, meningitis, phlebitis, etc.

An interesting point to note is that the gonorrhœa may disappear at the moment when the febrile condition of the septicæmia begins, as was the case with our patient. Barbiani mentions the following similar instance. A few weeks after the beginning of an attack of gonorrhœa a man was seized with generalized articular rheumatism. On questioning the patient closely he ascertained the existence of this previous gonorrhœa, which had suddenly disappeared when the new disorder commenced. Suspecting gonococcus infection a blood culture was made, which demonstrated that the supposed rheumatism was merely an articular manifestation of gonococcus septicæmia.

It will have been noted that profuse sweats were present during a period of several weeks, one of the predominating symptoms in our patient's case. This is also mentioned in other instances. Thus, with a patient of Widal's, there were attacks of fever ending in profuse perspiration, just as in a malarial attack; a patient of Silvestrini had "profuse sweating;" a woman mentioned by Thayer perspired to such a degree that her chemise was soaked; and with a patient of Bjelogowy's profuse sweating occurred several times a day.

The temperature in this form of septicæmia may be either intermittent, remittent, or continuous. Epistaxis, so common in

typhoid fever, must be very unusual in gonococcus septicæmia, as I do not find it mentioned in any of the thirty-seven cases whose reports I have examined.

Attention should also be drawn to the rather peculiar eruption presented by our patient, who, it should be said, had been taking no balsamic drug. At the beginning it had every appearance of typhoid rose spots, but on observing attentively the different eruptions that succeeded each other for several weeks on the abdomen, thorax, and thighs, it was found that this eruption was a polymorphic one: at one time it resembled the rose spots and at another it was formed of raised and reddish papulæ, which on certain occasions were quite similar to papulous syphilids. Similar eruptions are mentioned by other writers. Thus Silvestrini reports in his patient red lenticular spots on the side of the neck that did not disappear on pressure. One of Thayer's patients presented on the thorax and arms a disseminated eruption of small, reddish, raised spots disappearing on pressure and quite similar to typhoid spots except that they were more prominent. With another patient of Thayer's there were noticed on the abdomen a few suspicious papulæ resembling rose spots but not absolutely typical. When such eruptions manifest themselves in patients who have, in addition, other symptoms of typhoid fever, as was the case with our patient, it is not difficult to understand that the diagnosis can easily go astray; in such circumstances it can only be made by means of the serum test combined with blood cultures. Too much stress cannot be laid on this twofold means of diagnosis; if in our case we had not resorted to it, we should never have got on the right track.

In connection with the complications presented by our patient it may be useful to lay stress on some of the localizations that may manifest themselves during the course of gonococcus septicæmia.

Articular localizations, whether acute or chronic, are the commonest of all; when they are generalized they resemble acute polyarthritis, as in Barbiani's case. Arthritis was only lacking eight times, in the thirty-four cases of septicæmia collected by Faure-Beaulieu; it was entirely absent in our patient and also in a case reported by Scherrer.

Gonococcus endocarditis is such a common complication that

it is mentioned twenty-seven times in the postmortems that have been made; the left side of the heart is the one almost always affected, and the aortic orifice is more frequently diseased than the mitral. This gonococcus endocarditis is often ulcerous and proliferating, consequently liable to give rise to embolus. Here are a few such cases in brief.

I. A young man of 19 contracted a case of gonorrhœa and a few weeks later became feverish; his spleen was found enlarged, and his general appearance was that of a typhoid patient. A systolic murmur of endocarditis was observed, and, later on, signs of pericarditis. Diarrœa set in, breathing became stertorous, and the man succumbed in coma. Before his death, blood cultures had demonstrated the existence of gonococcus septicæmia. At postmortem examination, ulcerous and proliferating endocarditis of the tricuspid valve was found; the chordæ tendinæ of the valve were broken, and their free ends covered with granulations in which the gonococcus was demonstrated (Thayer and Lazar).

II. This was a case of gonorrhœa with cardiac symptoms, auscultation revealing a lesion of both mitral and aortic valves. The patient succumbed, but during his illness blood cultures had demonstrated the existence of gonococcus septicæmia. At postmortem there was ulcerous endocarditis of both orifices, and the microscope revealed the gonococcus at the aortic valves (Bjelogowy).

III. Case of a woman with gonorrhœa and gonorrhœal arthritis; blood cultures demonstrated the gonococcus, and an intense diastolic murmur was noted at the aortic orifice. The patient succumbed, and at postmortem there was found an enormous lesion of the aortic valves, which were perforated in places and covered with fresh vegetations, in which was demonstrated the gonococcus (Prochaska).

IV. A man with gonorrhœa and gonorrhœal arthritis, blood cultures showing the gonococcus, and an intense musical diastolic murmur being found at the aortic orifice. The patient succumbed, and at postmortem there was found on one of the aortic valves a large vegetation in which microscopic examination showed an abundance of gonococci (Thayer.)

V. A young negro of 20 contracted gonorrhœa, and two months later developed a typhoid condition. A Widal test proved negative.

On the twelfth day of the disease a loud murmur of mitral endocarditis was noted. The patient's condition grew worse and worse, pneumonia appeared in the left lung, and it was followed by coma and death thirty-eight days after the beginning of the infection. Blood cultures had previously demonstrated the existence of gonococcus septicæmia. At postmortem proliferating endocarditis was found; on the mitral valve there were enormous vegetations in which the gonococcus was demonstrated (Harris and Johnston).

VI. A young man of 17, who had previously had two attacks of acute febrile polyarthritis with cardiac complications, contracted gonorrhœa. A month later violent attacks of fever appeared, followed by profuse sweats. There was gonorrhœal arthritis of both knees. On auscultating the heart, signs were found of insufficiency of both orifices. The patient's condition grew worse; one day a sudden and violent pain behind the knee revealed an embolus, a few days later the man succumbed. Blood cultures had previously demonstrated gonococcus septicæmia. At postmortem there was found at the aortic orifice an old lesion due to the attacks of rheumatism, while at the mitral orifice there was a recent lesion caused by the gonococcus; on the large mitral valve there was an enormous vegetation in which numerous gonococci were demonstrated (Widal and Faure-Beaulieu).

All the cases just mentioned were instances of ulcerous and proliferating endocarditis; this shows that the gonococcus has a predilection for the endocardium and that its tendency is to give rise to the most serious type of lesion. It is, therefore, easy to comprehend how anxious I was at the appearance of a gonococcus endocarditis in our patient. Fortunately—and perhaps the vaccine treatment had something to do with it—this man's cardiac lesion improved and the noisy murmur of the early stages changed to one with a soft and favorable timbre. In some cases gonococcus endocarditis does not assume the grave form that ulcerates and proliferates; it is then not more serious than that of simple rheumatic endocarditis.

The lungs are sometimes affected during an attack of gonococcus septicæmia. Thus our patient had double bronchopneumonia which for a week placed his life in danger. An interesting point in this case was that the gonococcus was demonstrated in the expectoration.

On going through the reports of gonococcus septicæmia I find other cases of pneumonia, bronchopneumonia, and pulmonary infarct shown at postmortem. Thus in a case reported by Wynn there was bronchopneumonia; in a case of Thayer and Lazar's there was pulmonary infarct and various spots of bronchopneumonia; in a case reported by Thayer and Blumer there were several spots of bronchopneumonia with hemorrhagic infarct; a patient of Krause's had double pneumonia. Bressel has described a patient suffering from gonorrhœa without articular symptoms; he was seized with a stitch in the left side and his temperature rose to over 40° C. Blood cultures demonstrated gonococcus septicæmia. Bronchopneumonia developed on the left side, while sputum examination revealed the presence of the gonococcus as was the case in our patient. This case finally recovered.

Pleurisy has been reported several times during gonococcus septicæmia. Thayer and Lazar published the case of a man of 19 who several weeks after an attack of gonorrhœa developed a febrile condition with gonococci in the blood, followed by various complications, including pleurisy, and death; at postmortem there were 800 Gm. of liquid in the right pleural cavity and 550 in the left, the liquid being rich in gonococci. A patient of Prochaska's had had gonorrhœa, followed by epididymitis, when signs of a serious septicæmic condition manifested themselves. Blood cultures revealed the gonococcus. A few days later pleurisy showed itself on the left side, and clear serum was drawn off by puncture and produced cultures of the gonococcus. A patient of Scherrer's with a typhoid form of gonococcus septicæmia developed pleurisy; the liquid withdrawn by puncture contained the gonococcus, and at postmortem there were found in each pleural cavity several hundred grammes of liquid rich in gonococci.

It is, therefore, evident that gonococcus pleurisy is far from being an exceptional thing in the course of gonococcus septicæmia, and the pleural rubbing noted with our patient showed that there had been pleurisy on both sides that had gone through its evolution simultaneously with the bronchopneumonia.

A point to which particular attention should be drawn in this connection is the fact that gonococcus septicæmia has often the closest resemblance to typhoid fever. We have seen how difficult

this diagnosis was in the case of our patient. This man had been sent to us with the diagnosis of typhoid fever, and we must admit that all the symptoms were in favor of this disease; and yet it proved to be neither typhoid nor paratyphoid. Thanks to the serum test several times negative, and to blood cultures which revealed the gonococcus alone without any bacilli, we were enabled to eliminate the hypothesis of typhoid fever and to be sure of our diagnosis of gonococcus septicæmia. Nor is our case the only one, as there are other instances in which a diagnosis of typhoid fever has only been rectified by the serum test, by blood cultures, or by postmortem. The following case reported by Scherrer is most instructive.

A young soldier who had just been through his regiment's marching tests entered the hospital on March 5; it was only three days later that chance led to the detection of an insignificant urethral discharge very rich in gonococci. This discharge had begun two weeks previously and had been almost forgotten by the patient. During the evening of March 4 this soldier, who during the previous three days had been feeling out of sorts, was seized with rigors, headache, and severe malaise, his temperature then being 38.9° C. He tried to sleep, but lay awake most of the night much disturbed by profuse sweating. Next morning his temperature was 39.4° C., and he was taken to the hospital, his temperature in the evening being 40.3° C. and his pulse 100, while in addition to the preceding symptoms there was slight dyspnoea and profuse diarrhoea. During the following days his pulse was manifestly dicrotic, there was utter prostration, and the temperature oscillated in the neighborhood of 40° C.

In presence of these symptoms a diagnosis of typhoid fever seemed probable, as the man's condition was more or less that of a patient at the end of his first week of enteric fever. But in spite of appearances the serum test made on March 8 and again on March 10, under the most favorable conditions, was manifestly negative. In the meantime his condition became rapidly worse; prostration was complete, and a soft murmur at the heart was detected. Then appeared most troublesome hiccoughing, and the abdomen grew distended and painful to pressure; these symptoms pointed to peritonitis.

On March 11 there were further complications; the dyspnoea increased, and auscultation showed mucous râles in both lungs, with diminished breathing at the left base. The expectoration was viscous and bloody. On March 12 pleural effusion was found, and puncture drew off a liquid rich in gonococci; the patient's condition then grew rapidly worse and he succumbed at noon.

Postmortem showed that the man had succumbed to gonococcus septicæmia, without any lesions of typhoid fever. On opening the abdomen peritonitis was found, with agglutination of the intestines and a little purulent liquid in the pelvis. Examination of the false membranes covering the kidney showed numerous gonococci. There was atelectasis of the lungs; each pleural cavity contained a pint of purulent liquid rich in gonococci; the mitral valves had lost their transparency and their free edge was swollen; examination made of a concretion found on the mitral valve showed abundant gonococci, which were also again detected in the secretion taken from the urethra. No lesion of typhoid fever was observed. The small and large intestines were carefully examined; there was no perforation, the mucous membrane was normal, and Peyer's patches and the solitary follicles were not swollen. The spleen was normal. The patient had therefore succumbed not to typhoid fever but to the typhoid form of gonococcus septicæmia.

The remarkable point in this history is the rapidity with which the events took place. After an attack of gonorrhœa, so slight that he had almost forgotten it, this man took to his bed Thursday evening and died on Friday of the next week. This shows that in this infection, as in other disorders, there is a fulminating, hyper-toxic form, not unworthy of the term malignant.

I wish still to give in brief other instances concerning patients who appeared to have typhoid fever, but in whom the diagnosis of gonococcus septicæmia was finally made, thanks to the serum test and to blood cultures. Thayer has published the case of a man who had had gonorrhœa for three months, when he was suddenly seized with headache, malaise, and prostration, and his temperature rose to 40° C. His tongue was coated, his spleen enlarged, there was a systolic murmur of the heart, and on the abdomen some suspicious-looking papulae very like rose spots but not absolutely typical were found. Under these conditions the

diagnosis between typhoid and gonococcus septicæmia with endocarditis was uncertain, and the question was not settled until the serum test was found to be negative and blood cultures revealed the gonococcus. The same could be said of a patient reported by Harris and Johnston, with whom the diagnosis inclined toward typhoid fever until the serum test proved negative and blood cultures showed the gonococcus.

Cases such as these show beyond peradventure that gonococcus septicæmia has the closest clinical resemblance to typhoid fever, and they prove likewise that the differential diagnosis is sometimes impossible without the assistance of the serum test and of blood cultures.

WOMEN IN MEDICINE *

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ORDINARILY we are apt to presume that the entrance of women into the medical profession is a comparatively recent event and is a phase of that social evolution in which the race is supposed to be engaged. We are "the heirs of all the ages, in the foremost files of time"; and consequently, the moment for the uplift of women having arrived in the course of evolution, she is at last coming to her own and is securing the privilege of entering the medical profession. This whole idea of evolution so occupies men's minds that to be told that many of the phases of our supposed progress of very modern time are only repetitions of things that were in vogue long, long ago, usually on more than one occasion, and then were somehow lost, comes as a distinct shock. There is no doubt, however, that this is literally true, and nowhere are there more striking examples of the way history repeats itself after intervals than in the history of medicine—as regards regulation in a legal way, professional standing, medical education, and even the entrance of woman into medical practice and medical teaching.

As a matter of fact, whenever medicine has become practical, abandoning theories and setting itself to the care of the sick rather than the cure of disease—that is, whenever there is a great new development in medicine—women have always become prominent in it, and have not only received training as nurses, but have even been allowed the privileges of medical education and have greatly helped in the development of practical medicine by their work as medical teachers. This is such a surprising idea for most people, who are accustomed to think that we are now for the first time witnessing the entrance of woman into professional medical life, that it seems all the more important to dwell on it. Our present condition represents only one of those curious alternations of medical

* An address delivered at the Annual Dinner of the East Side Association of Physicians of New York City.

progress and development that are perhaps the greatest surprise in the history of medicine. It is no uncommon thing to find that after certain advances had been made they were in course of time entirely forgotten, and then had to be made over again with all the travail and labor of a new birth. Some time someone will write a volume of history on how men have forgotten things that they had once done and done well, and then we shall have a very interesting addition to history as it has been written up to the present time.

It seems all the more important to know this at the present time, and to bring it out emphatically, because it is only in this way that we may be able to retain the advances that we make and not permit them to get away from us again. Ordinarily it is assumed that professional dignity and education are at their highest point at the present time; yet seven centuries ago, according to a law of the Emperor Fredrick II, promulgated for the Two Sicilies—that is, the southern part of Italy and Sicily proper—students were required to spend three years of preliminary study in the undergraduate department of the University, and then four years in the University Medical School, and a fifth year in practice with a physician; before they were allowed to take up the practice of medicine. When we recall that at the middle of the nineteenth century, here in the United States, only two terms of about sixteen weeks each were required in most medical schools, and in one school with a high reputation, indeed only one year of nine months, we can see how low the standards of medical education, and with them, of course, of professional dignity, had fallen during the six centuries since the thirteenth.

What they taught at these old medical schools constitutes perhaps the greatest surprise for those who would be likely to consider that they cannot have known anything of medicine, and above all of surgery, in that olden time. They used opium very well. They had two forms of anesthesia. They taught the use of red light in the treatment of smallpox. They used water cures and climatic cures rather freely. The great medical schools and hospitals were situated on the shores of the Mediterranean in salubrious climates. It was in surgery, however, that their greatest triumphs were won. The great surgeons of the thirteenth and fourteenth centuries practically succeeded in accomplishing everything that our modern surgeons have done. They trephined very freely, they in-

sisted on the lifting of depressed fractures of the skull, they opened the thorax for pus, they sewed up wounds of the intestine, they operated very freely for the cure of hernia. One great surgeon of this time, Guy de Chauliac, insisted that hernia was operated on more for the benefit of the surgeon's pocket than for the benefit of the patient—an expression that sounds strangely modern. He did his operations for hernia in an exaggerated Trendelenburg position, with the patient suspended head downwards on a slanting board. His rules for passing a catheter are excellent. He was unsurpassed for five centuries in the treatment of fracture. We do not know the work of Guy de Chauliac by chance historical hints or by any mere tradition, for we have his text-book of surgery, which for three centuries after his time was the book on surgery most often consulted in all of the European medical schools. It is no wonder that all of the great writers on the history of medicine have insisted on proclaiming this great surgeon of the fourteenth century as one of the most wonderful contributors to surgical development that has ever lived.

One fault, alas! he had, but that was a very serious one. His great predecessor in Italy, William of Salicet, had suggested the necessity for the utmost cleanliness in operating and had practically taught union by first intention. It is Sir Clifford Allbutt, the Regius Professor of Medicine at the University of Cambridge in England, who makes this declaration. This theory, as he considered it, of the possibility of getting union by first intention Guy de Chauliac would not accept. He taught that pus formation was necessary in order to get union. It was his genius that stamped the idea of the necessity for pus formation in healing processes on the mind of the surgical profession of Europe for the next five centuries. It is but another example of how men follow a leader, and how, if that leader makes a great mistake, his mistake is likely to be perpetuated in the minds of men who do not think for themselves but who must wait until another great original thinker comes to set them right.

With all procedures in medicine and surgery to remind us of our own times in the long ago, it will not be so surprising to find that women occupied a very definite place in medicine, and that from the earliest dawn of modern medical education women were given some opportunities, and for the better part of several cen-

turies, at least, apparently as good opportunities, for the education in medicine and the practice of the medical profession as are afforded even in our own time. When men awoke from the barbarous condition which had held them in its grasp since the invasion of Italy by the Goths from the North, the first great University of modern times was founded at Salerno. The nucleus of it was a medical school. We know a good deal about this medical school, and we have the books of many of its professors. Constantine from Africa, or Africanus, as he is called, the Plateariuses, father and son and grandson, Alphanus, Desiderius, and many other names of professors are now well known in the history of medicine. Of course a great deal of what was taught at the University is absurd, and especially is this true of what was taught about therapeutics; but then it may be well to recall what Prof. Richet said not very long ago in the *Revue des Deux Mondes* of Paris, in an article on "Medicine and Physicians," when he stated that the therapeutics of any time in history is always absurd to the second succeeding generation.

Perhaps the most interesting phase of the history of medicine at Salerno is to be found in the fact that a department of the diseases of women was under the direction of a woman, and that two or three, at least, of her successors were also women. The first distinguished woman professor was Trotula, who was the wife of Platearius, a professor of medicine at the University, and was the mother of another Platearius, who also became a professor at the University. The books of father and son have come down to us. Trotula founded, not in the literal but in the figurative sense, what has come to be known as the Salernitan school of woman physicians. We have her book, and we realize how serious was her attention to the diseases of women; and above all we realize how thoroughly practical was the attempt to get at some of the important problems of gynaecology. Still more interesting is the fact that her book was widely circulated, quite beyond the bounds of her own country and outside of her chosen profession, so that even a French poet, Rutebeuf, of the next century deplores the fact that the women of his time used so many quack medicines, so many vaunted remedies for their various ills, and so many fake cosmetics to improve their beauty, instead of going to the wonderfully sensible book of Trotula, the great Salernitan woman physician, and finding the proper sug-

gestion and above all learning there not to use too much medicine and not to believe too much in remedies, but to employ common sense.

There are many references to other women physicians at Salerno which show how well the tradition of feminine teachers and practitioners was established in Southern Europe. A whole series of prescriptions attributed to the women physicians of Salerno, *Medicee Salernitanæ*, as they were called in the Latin of the time, found their way into medical literature during the twelfth century. Platearius, a well-known medical writer at the end of the twelfth century, quotes a number of them. Renzi, who about the middle of the nineteenth century wrote a history of the medical school at Salerno, mentions the names of three: Abella, who wrote on Melancholy; Mercuriade, who occupied herself with surgery and wrote books on ointments and on the cure of wounds; and Rebecca Guarana, who belonged to a well-known family of Salerno, a distinguished member of which was a physician and an historian. Mazza in his "History of the City and University of Salerno" says that "Rebecca Guarana was the author of a book on fevers."

If further evidence than this is needed, there is in the Royal Neapolitan Archives a license issued in the year 1321 to a woman physician of Salerno, which contains as one of its preambles this paragraph: "Since moreover the law permits to women the exercise of the profession of a physician and as besides due regard being paid to public morality it seems better that the diseases of women should be treated by women physicians we accord by this document to the said Francois, wife of Matthew De Romana of Salernum after she has taken the usual oath the permission to practice medicine."

It was here in the far South of Italy that the education of physicians of Europe was reborn, and, above all, that the study and development of the practice of medicine took place. This is not so surprising as it might otherwise seem if we recall that this southern portion of Italy, which had been originally settled by Greeks, was constantly in touch with Greek culture, Greek literature, and Greek medicine, and besides was more intimately in contact with the East and with the northern shores of Africa, where the Arabs were cultivating medicine, than any other portion of Europe. There was less need for the vitalizing spirit of old Greek thought, embodied in

the Renaissance, to come to Southern Italy than anywhere else; and so here there was an earlier Renaissance. That they should have allowed the privileges they did to women is of course quite surprising, for we have no record of any such thing occurring among the Greeks. That they did so, however, there is no doubt, and the facts make it very clear that a series of broad-minded generations began modern history and laid the foundation of modern feminine education in the southern portion of Italy.

What we thus find in the South of Europe is confirmed by certain manuscripts that have been published in the last few years with regard to medicine in the North of Europe. In 1882 a series of the writings of the Abbess Hildegarde, who had been the Superior of a monastery for women along the Rhine in which many of the Sisters were engaged in caring for the sick, was published; and these show that there was great interest in medicine in the twelfth century in the Rhineland, and that the *religieuses* were given definite instructions as how to care for the ailing. Reuss, who wrote the preface to the edition of St. Hildegarde's works contained in Migne's celebrated collection of writings of the olden time, declares that "among all the members of religious orders who have exercised the art of medicine in the Middle Ages or who have written books concerning it undoubtedly the first in point of excellence is Abbess Hildegarde." According to the monk Theodoric, who was the eye-witness of many of her cures, the Abbess possessed the faculty of curing people to such a high degree that no sick person had recourse to her without recovering health. There are among the books of the *religieuse* a work the subject of which is physic and medicine. Its title is, "De Natura Hominis Elementorum Diversarumque Creaturarum," Concerning the Nature of the Elements of Man and of the Different Creatures. This book contains, as Theodoric has told, the secrets of nature which were revealed to the sympathetic spirit of the Abbess. "All those," he says, "who want to write the history of the medical and natural sciences ought to read this volume, in which this *religieuse* of the twelfth century, initiated in all that her epoch knew of the secrets of nature, examines and investigates even in their intimate essence most of what was plunged in darkness up to that time." He adds that "it is certain that Hildegarde was familiar with many things of which the doctors of the Middle Ages were ignorant."

Dr. Lipinska, who in 1900 wrote as the thesis for her doctorate in medicine at the University of Paris a "History of Women Physicians," summed up her opinion of the value of Hildegarde's work after consulting the original documents in the matter, some of which are still unedited in the Bibliothéque Nationale in Paris. She says: "Various passages contain in germ some very modern discoveries and teach useful lessons. The Abbess distinguishes a double mode of action of different substances in the organs of the human body. There is a chemical action dependent on a chemical composition of the substances themselves. Salts of lead and mercury, for instance, when placed in contact with the mucous membrane of the intestines determined chemically the spasms which we call lead and mercury colic. The other action is of drugs and is called mystic, or, more exactly, magnetic. The metallo-therapy of modern science is to be found entirely in the works of St. Hildegarde. She suggested the very practical thought that simple drugs should be used for the poor, and complicated prescriptions for the rich. In general the work seems to be the fruit of a very practical mind thoroughly familiar with the practice of medicine."

Knowing what we do of the history of medicine and of the part that women played in it at Salerno, and even farther north in Europe, it is not surprising to find that when the medical schools came into intimate connection with the Universities, as they did in the thirteenth century in Italy, women were allowed to take up the study of medicine, and that we have the records of many of them who reached distinction in the profession. At the University of Bologna, originally founded as a School of Law, but naturally developing into a University, women were allowed to study law—at least, we know of some of them who did study law even before the end of the twelfth century. This custom continued in the thirteenth century and spread also to the medical department of the University. During the thirteenth century there are a number of women's names in the medical profession in Italy, and some of them even became distinguished as professors or at least as teachers in certain departments of medicine. Perhaps the most interesting, certainly the most startling, thing to learn concerning this entrance of women into medical life is the fact that some of them took up anatomy as their specialty and one of these, Alessandra Giliani of Persiceta,

a country district not far from Bologna, became especially enthusiastic about dissection.

She studied anatomy under Mondino, whose text-book of dissection became the standard manual in the hands of every dissector for the next three centuries. This young woman pupil became so skilful that she was made the prosector of anatomy. How seriously she took up this difficult work may be judged from the fact that it was to her that we owe the practice of filling the veins and arteries with various colored fluids and then varnishing the preparations so that they might be preserved for a long time for demonstration purposes. The account of this is no mere tradition, for there is a famous paragraph in one of the old Chronicles which fully corroborates the more modern traditions in the matter. I have quoted it in "The Popes and Science" (Fordham University Press, New York, 1908).

"According to the *Cronaca Persicetana*, quoted by Medici in his history of the Anatomical School of Bologna, she became most valuable to Mondino because she would cleanse most skilfully the smallest vein, the arteries, all ramifications of the vessels, without lacerating or dividing them; and to prepare them for demonstration she would fill them with various colored liquids, which, after having been driven into the vessels, would harden without destroying the vessels. Again, she would paint these same vessels to their minute branches so perfectly and color them so naturally that, added to the wonderful explanations and teachings of the master, they brought him great fame and credit." This whole passage shows a wonderful anticipation of all our most modern methods—*injection, painting, hardening*—of making anatomical preparations for class and demonstration purposes.

Some of the details of the story have been doubted, but her memorial tablet, erected at the time of her death in the Church of San Pietro de Marcellino of the Hospital of Sancta Maria de Maretto, gives all the important facts, and tells also the story of the grief of her fiancé, who was himself Mondino's other assistant. This was Otto Agenius, who had made for himself a name as an assistant to the chair of Anatomy in Bologna, and of whom there were great hopes entertained because of the early signs of genius which he showed as an investigator in anatomy. These hopes were destined to grievous disappointment, however, for Otto died sud-

denly, before he had reached his thirtieth year. The fact that both these assistants of Mondino died young and suddenly would seem to point to the fact that probably dissection wounds in those early days proved more often fatal than they did a century or more ago, when the proper precautions against them were not so well understood. The death of Mondino's two prosectorors in early years would seem to hint at some such unfortunate occurrence.

It is curiously interesting to realize that later on in the history of medicine another and further great improvement in the material for the demonstration of anatomy came, like the first one, from the hands of women. It was Alessandra Giliani who had invented the method of injection, coloring, varnishing, and preserving dissecting material so that it might be kept for a long time. Thus the necessity for the deterrent and even dangerous work of dissection, which must have been doubly disgusting and risky in those early days before experience had taught anatomists how to prepare bodies for dissection, was to some extent done away with. Some four centuries later, when wax models properly colored for demonstration purposes in anatomy were introduced, it was a woman who invented them and first prepared them with such skill as to make them popular at Italian Universities. This was the well-known Madame Manzolini, an assistant to the professor of anatomy at the University of Bologna.

Obstetrics, of course, was practically exclusively in the hands of women in earlier times; gynaecology advanced only when women themselves paid attention to it. It must not be forgotten that the great father of Greek medicine, Hippocrates, went no farther in the diagnosis of women's diseases than to ask the women patient to examine herself and tell him what she felt with her examining finger. From her description he would decide what was probably the matter. This was, of course, an extremely unsatisfactory method of diagnosis; but anything like our modern method seemed to the notions of that earlier time so entirely opposed to the feelings of modesty as to be out of the question. Obstetrics was quite as much sacred to women themselves, and there are some sad stories of the fate of men who, prompted by curiosity, attempted in some underhand way to learn something about the process of birth. This has happened even in centuries approaching our own. Delacoux, for instance, in his "Biographies des Sages Femmes Célèbres," a

series of biographical sketches of celebrated midwives, tells of a Dr. Wertt who, in 1522, was burned alive at Hamburg because he disguised himself as a midwife and assisted at an accouchement. There are traditions of other such misfortunes happening to men who, contrary to the sentiment of the community with regard to the proper relations of men and women, endeavored to advance the bounds of scientific knowledge in this matter of obstetrics.

It is not surprising then that when in the thirteenth century there came the first great uplift of hospital organization women were put in charge of most of the hospitals. Virchow has told the story of this hospital organization, and I have quoted from him rather freely in my book, "The Thirteenth the Greatest of Centuries."¹ Practically every town of 5,000 inhabitants in Europe built a hospital for the care of its ailing poor and for accident cases. This was the great origin of city hospitals, and they were rendered possible principally by the religious orders of women, which took charge of them. All the women and children were cared for exclusively by women, and nearly all the surgical cases, too, were cared for by women. When the danger from leprosy was recognized, isolation hospitals for this disease were erected outside of all the towns, even those of comparatively small size. Under the charge of women they succeeded in obliterating what had become a great folk plague or endemic not unlike tuberculosis in our own time. Indeed, it is probable that the best possible example we could have of how a widespread contagious disease may be effaced is to be found in this great hospital movement for leprosy, the success of which was so largely due to the self-sacrificing devotion of women.

These opportunities for women continued until after the Renaissance, in spite of the fact that during this period of the New Learning in Europe, women received abundant opportunities for the study of the classics and became distinguished as scholars in every country. Besides the great women of the Renaissance in Italy, the D'Estes, the Gonzagas, Vittoria Colonna, and many others, there were distinguished feminine scholars at this time in France, in Spain, and in England. Queen Elizabeth knew Greek well; Queen Mary was as thoroughly educated a woman as had been

¹ The Thirteenth the Greatest of Centuries, Catholic Summer School Press, N. Y., 1907.

her mother Queen Isabella of Spain, Lady Jane Grey preferred reading Greek to going to routs and parties, and Mary Queen of Scots knew her Latin well, very probably some Greek besides, and at least three modern languages. With their rulers thus interested in the higher education we can be sure that the nobility and the people generally, who always imitate the upper classes, were not without interest in educational subjects. In spite of all this, perhaps as a reaction against these educational privileges for women, there came in the next few centuries a distinct revulsion of feeling, and women were accorded ever fewer and fewer opportunities for intellectual development and expression. Nay, more, they were even denied the opportunities that they previously had of manifesting their sympathy and beneficence in the care of the sick.

As a consequence of this unfortunate movement, so difficult to explain, the hospitals of the seventeenth and eighteenth centuries sank ever lower and lower in their care for the sick until finally they became a disgrace. Miss Nutting and Miss Dock in their "History of Nursing" ² have placed at the end of their first volume a very interesting chapter on "The Dark Period of Nursing." Most of us are inclined to think that our progress in modern times is a direct development from older times when the world had not as yet awakened to great humanitarian ideas, and we are prone to think ourselves as representing an acme in human evolution in this as in everything else. As a matter of fact, our present very praiseworthy state of affairs in the hospitals was preceded by a period of supreme neglect of the sick for several centuries, though in the later Middle Ages and at the beginning of modern times in the fifteenth and sixteenth centuries there had been very judicious and painstaking care for hospital organization. The beginning of this chapter on "The Dark Period of Nursing" by Miss Nutting and Miss Dock is as follows: "*It is commonly agreed that the darkest known period in the History of Nursing was that from the latter part of the seventeenth up to the middle of the nineteenth century.* During this time the condition of the nursing art, the wellbeing of the patient, and the status of the nurse all sank to an indescribable level of degradation."

This would be quite enough to make it clear beyond all doubt that there has been an interval of supreme neglect after a former

² Putnams, N. Y., 1908.

period of lofty humanitarianism in hospital work; but for those who need further authority there is the quotation from Jacobson's Essays on "The History of Care for the Ailing,"³ which is quoted by the American Historians. Jacobson said: "During the first two-thirds of the eighteenth century nothing was done to bring either construction or nursing to a better state. Solely among the religious orders did nursing remain an interest and some remnants of technic survive. The result was that in this period the general level of nursing fell far below that of earlier periods. The hospitals of cities were like prisons, with bare undecorated walls and little dark rooms, small windows where no sun could enter, and dismal wards where fifty or one hundred patients were crowded together, deprived of all comforts and even of necessaries. In the municipal and State institutions of this period the beautiful gardens, roomy halls, and springs of water of the old cloister hospital of the Middle Ages were not heard of, still less the comforts of their friendly interiors."

The reasons for this sinking of hospital organization is traced very clearly by the American historians of nursing. There seems to be no doubt that their reasoning in the matter is the true one. Whenever men assume to themselves, to the exclusion of feminine co-operation, the care of hospitals or institutions where the sick and the weak are to be provided for, great abuses always creep in, and womanly solicitude and tenderness are needed to prevent serious evils. Even with this there may be many things to deprecate in institutions, but without it there are inevitable deterioration and eventual disappearance of the true humanitarian spirit. Miss Nutting and Miss Dock said on this subject: "In all of the hospital and nursing work of the Christian era this was the period of the most complete and general masculine supremacy. At no time before or since have women been quite without voice in hospital management and nursing organization, but during this degraded period they were all but silenced. The ultimate control of the nursing staff, of their duties, discipline, and conditions of living, was everywhere definitely taken from the hands of women and lodged firmly in those of men. Even where a woman apparently stood at the head of a nursing body, she was only a figurehead, with

³ Beiträge zur Geschichte des Krankencomforts, Deutsche Krankenpflege Zeitung, 1898, in 4 parts.

no power to alter conditions, no province that she could call her own. The state of degeneration to which men reduced the art of nursing during this time of their unrestricted rule, the general contempt to which they brought the nurse, the misery which the patient thereby suffered, bring a scathing indictment against the ofttimes reiterated assertion of man's superior effectiveness, and teach in every branch of administration a lesson that, for the sake of the poor, the weak, and the suffering members of society ought never to be forgotten—not in resentment, but in foresight, it should be remembered. Neither sex, no one group, no one person, can ever safely be given supreme and undivided authority. Only when men and women work together, as equals, dividing initiative, authority, and responsibility, can there be any avoidance of the serfdom that in one form or another has always existed where arbitrary domination has been present, and which acts as a depressant, effectually preventing the best results in work."

In a word, everywhere in the history of medicine we find that the admission of women to a considerable part in the care for the ailing had always resulted in benefit to mankind and to medicine itself. When women have been deprived of their opportunities as nurses and even as physicians, then medicine has become theoretical and has cared for the disease rather than the patient. Woman's care has been largely for the individual patient, and, as any one who knows the history of medicine will appreciate at once, it is when physicians have cared more for the patient than his disease that real progress has been made. Theories of disease which were to work revolutions have always failed, but improvements in nursing and in the care for the individual have always borne fruit of enduring benefit. These points in the history of women and medicine are surprising to most of us when we first have our attention called to them; and because they are not ordinarily seen in a connected story, we do not appreciate their significance. It seems worth the while, however, for us to recognize that history merits serious study only inasmuch as the story of the past may help us to avoid mistakes in the present and prove suggestive for the future. Men and women have evidently a co-ordinate work in caring for the ailing, and the sooner we take this lesson to heart, the lesson of history as well as of human nature, the more certain will be the progress in humanitarianism and in medicine.

THE ASSOCIATION OF MIGRATING THROMBOPHLEBITIS WITH THROMBO-ANGEITIS OBLITERANS

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ALTHOUGH, in the disease which I have designated by the term "thrombo-angeitis obliterans," the pathology of the vessels and many of the clinical symptoms dependent upon the lesions are easy to understand, the exciting causative factor responsible for the extensive obturating thrombotic process is still unknown. It seems, then, that our efforts should be directed towards a careful study of all those features of the malady that may throw light on its pathogenesis. When, therefore, in the course of my observations I first noted the association of migrating thrombophlebitis of the superficial veins of the lower extremities with the symptom-complex characteristic of occlusion of the deep vessels, it appeared to me of no little moment to determine whether the newly discovered phenomenon was not another manifestation of the same malady. Since then other cases have come to my notice, so that I am able, to-day, to report on nine patients who at one time or other in the course of the disease have suffered from attacks of thrombophlebitis involving either the upper or the lower extremities.

I wish, therefore, to show what form the affection of the superficial veins may take, to point out briefly the pathological changes as far as they could be investigated, to compare the lesions with those found in the deep vessels (thrombo-angeitis obliterans), and to discuss the significance of the manifestations in the light of the data furnished us by the histories of the nine cases.

In New York, with its rapidly increasing numbers of Polish and Russian Hebrews, the disease is becoming exceedingly common. Thus I have been able to collect data on over fifty cases during the past three years, and have made pathological studies on the vessels and nerves from twenty-two amputated limbs. Inasmuch as the malady is still so frequently confounded with "erythromelalgia," "Raynaud's disease," and "arteriosclerosis" of

the vessels of the lower extremities, it may not be amiss to sketch briefly the more usual symptoms.

Beginning in most instances with indefinite pains in the sole of one foot, in the ankle, or in the toes, the patients soon notice that they are disturbed in their walk by the sudden onset of cramp-like sensations in the calf or elsewhere in the leg. These feelings make them take frequent rests, often inducing them to investigate the condition of their limbs. Some take off their shoes and rub the parts in the hope of either dispelling the pain or banishing the uncomfortable numbness in the toes and feet. Others say that the feet become cold and numb when the temperature is low and when the weather is inclement.

After the lapse of weeks, months, or even years, evidences of trophic disturbance make their appearance. Following the cutting of a nail, or without apparent cause, an abraded spot or hemorrhagic bleb, a pustule, or a dry, dead patch of skin develops near the tip of one of the toes or under a nail. Now the local pain becomes excruciating during the night as well as day, so that some of the sufferers beg for amputation of the affected part.

It is during the first attack of trophic disorder that the physician usually notices another characteristic symptom, namely, a peculiar blush of the toes and fore part of the foot, sometimes extending to the ankle or slightly above, when the limb is in a pendent position. Upon allowing the limb to hang down, the affected toe soon turns color; it assumes a bright red hue which is seen to pass to the other toes and then up the back of the foot for a variable distance. The elevated extremity, on the contrary, rapidly becomes blanched. Sometimes the superficial ulcer will heal under conservative treatment and the patient will either recover perfectly or his symptoms will become chronic. At this period his limb will show the scars left by previous ulcers; the dorsalis pedis and the posterior tibial artery usually fail to pulsate, and ischæmia in the elevated position and redness or "erythromelia" (as I have elsewhere termed it) in the pendent position are regularly elicited. Sooner or later, however, be it in the extremity first affected or in the limb not yet diseased, an ulcer will give way to dry gangrene and amputation will be the issue.

Because of the striking condition of redness in the dependent

position, and because of the increase of local pain when the limb is hanging down, a number of clinicians have been wont to diagnose "erythromelalgia" in these patients. Some cases have been regarded as examples of Raynaud's disease, because in them the symptoms of blanching and cyanosis of the parts were prominent features. Although resembling erythromelalgia and Raynaud's disease in a number of symptoms, the clinical picture of thrombo-angiitis obliterans, as we see it, is so characteristic and definite that an attempt should be made to put it into a separate class.

For the sake of clearness I shall briefly summarize the vascular lesions.¹ Most of the larger arteries, and sometimes the veins as well, are obliterated over a large extent of their course. All stages in the occlusive change may occur in the various vessels of an extremity or in the same vessel in different parts of its course. The closure of the vessels is effected by red obturating thrombi; these become organized, vascularized, and canalized. Recent red thrombosis may involve large portions of arteries or veins and is not secondary to the gangrenous process. It occurs even when no gangrene is present. In short, we are dealing with lesions of considerable extent apparently initiated by the formation of occlusive thrombi, chiefly in arteries, but not confined to these, followed by organization or healing, with an attempt at the production of sufficient collateral circulation.

The composite clinical picture described above does not, however, hold true for all the cases. I have elsewhere² referred to some of the variations that may occur, and have even alluded to the associated thrombosis of superficial veins. Here I shall consider only those patients in whom thrombophlebitis of superficial veins was found to be wholly independent of any trophic disturbance, gangrene, or inflammatory process, and in whom it was manifestly of primary origin.

I. THROMBOPHLEBITIS WITHOUT SYMPTOMS

There are patients who have no knowledge of the occurrence of any trouble in the veins of the leg, but in whose amputated limbs extensive old or old and recent thrombophlebitis of the internal

¹ American Journal of Medical Sciences, October, 1908.

² Journal of the American Medical Association, 1909, pp. 1319-1325.

saphenous or its tributaries is discovered. Such a case was J. C., who could recall nothing referable to a disturbance in the superficial veins. Study of the vessels revealed old occlusion of a large part of the saphena by virtue of a thrombotic process, and some areas of more recent thrombophlebitis.

CASE I.—J. C., 45 years, Russian Hebrew, admitted to Mt. Sinai Hospital May 18, 1908; has eight children (all well); gives a rather typical history of vascular disease of both lower extremities resulting in amputation of the left leg at the knee. Four years ago he had "rheumatism" of the right leg with pain in the sole of the foot and redness of the toes lasting eight months. Since then it has not troubled him. The left leg, however, began to hurt him last summer; he could not walk a block without taking a rest. His big toe became "sore" recently and now the pain in the foot is constant. He is told that the big toe is becoming gangrenous and that his leg should be amputated, which he gladly permits.

With the observation just cited, no new clinical facts had been adduced, but certain similarities between the thrombotic lesions of the saphenous vein, as seen under the microscope, and the changes characteristic of the closed deep vessels were deemed sufficiently suggestive to warrant the suspicion that here, in the superficial veins, a new territory for the process "thrombo-angeitis obliterans" had been found. We shall see in the histories that are to follow further evidence in favor of this assumption.

II. THROMBOPHLEBITIS WITH SYMPTOMS OF LIMITED VEIN INVOLVEMENT

A more interesting group is represented in those patients who come to us with active thrombophlebitic and periphlebitic manifestations. Here and there along the course of the internal or external saphenous vein apparently spontaneous alterations in the skin and subcutaneous tissues occur. These are in the form of small erythematous slightly indurated patches, less than a centimetre in diameter, and tender to the touch. Were it not for the concomitant phenomena referable to the tributaries of the saphenous or the trunk itself, the nature of these cutaneous nodosities would have remained obscure. With the appearance of these, however, or at other times in the course of the disease, cord-like thickenings of

portions of the long saphenous, with or without adhesions to the skin, are frequently observed. As examples let us briefly tell the story of Cases II and III in Group II.

CASE II.—S. S., 30 years old, Russian Hebrew, admitted to Mt. Sinai Hospital July 8, 1907; father of one child; has been suffering for four years with "weak legs;" for two years there has been pain in his left foot. About one and one-half years ago the second toe became gangrenous and was removed. Last winter his attention was directed to the blueness of the toes; it was difficult to keep the left foot warm. *For a couple of years he has noticed that "red spots" come and go along the inner and outer side of the shin bone.* They are a little painful and disappear without treatment. Now he seeks advice because the little toe looks as if it were going to die off. *Amputation just above the middle of the leg.*

Diagnosis.—A typical case of thrombo-angeitis obliterans with gangrene of the little toe of the left leg and cutaneous nodosities along the course of the internal saphenous vein from the ankle up to the region of the tubercle of the tibia; probably closure of a part of the saphenous vein.

The study of the vessels of the amputated leg showed extensive occlusion of the posterior tibial, anterior tibial, peroneal, and plantar arteries (thrombo-angeitis obliterans). The long saphenous vein was filled for the most part with old organized tissue of a type indistinguishable from that seen in the deep vessels, and some of its tributaries were closed by more recent obturating masses. The cutaneous nodules corresponded to the distribution of the finer tributaries, but inasmuch as they had almost completely disappeared at the time of operation no histological examinations were made.

As representative of the occurrence of migrating thrombo-phlebitis of the long saphenous and of erythematous nodosities in the same patient let us cite Case III, who observed and related quite accurately how the painful "hard cords" developed.

CASE III.—F. S., 37 years old, Russian Hebrew, father of two healthy children, admitted to Mt. Sinai Hospital Dispensary April 13, 1909; says that he remembers having had peculiar pains in the soles of both feet on walking a few blocks for the last three or

four years. About four months ago the big toe began to trouble him, but even before that he noticed *hard cords* along the inner side of the leg. Since then the nail of the big toe came off, leaving a raw wound which refuses to heal. The long hard strands come and go; sometimes they are seen high up on the leg; at others, three or four inches above the ankle. *Besides this there are lumps further back on the inner side of the leg.* Patient does not return for treatment, so that the further course of the disease is unknown.

On physical examination the usual signs of thrombo-angeitis were found, with a trophic ulcer of the big toe. There were no evidences of recent thrombosis of the long saphenous other than one hard node four inches above the ankle; evidently the last attack of thrombophlebitis had subsided. The other leg showed somewhat less advanced symptoms of the disease.

Here then we are dealing with a case in which both the patient's narrative and ocular evidence point to the association of superficial and deep thromboses.

III. MIGRATING PHLEBITIS CAUSING THE PATIENT TO SEEK TREATMENT

When the attacks of migrating phlebitis make their appearance early in the history of the case, and when the attendant discomfort and pain is sufficiently great, then the symptoms belonging to the true deep-rooted affection—*thrombo-angeitis obliterans*—are sometimes wholly ignored by the patient and remain undiscovered by the physician. Medical advice is sought only for the “lumps” and “hard tender strands” or “cords” that are oftentimes so disturbing. Such observations are of no mean importance in diagnosis, since they have taught me to seek for the early subjective and objective signs of thrombo-angeitis in every patient in whom there are spontaneous and unaccountable attacks of inflammation of superficial veins. Let us see what we can learn then from Group III, in which migrating phlebitis causes the patient to seek treatment.

CASE IV.—E. B., 36 years old, Austrian Hebrew, consulted me on January 17, 1909, with the history of having had stinging sensations on the inner side of the right leg, low down, some three months previously. A few days after the onset of this trouble he

could feel a long *thickened "lump"* behind the shin bone, a short distance above the ankle. Soon after this another swelling, not unlike a "hard cord," appeared somewhat higher up on the leg, was very tender, and was succeeded not many days later by a third somewhat shorter strand.

Upon close questioning he admitted that although he seeks relief from the symptoms mentioned, he has been annoyed for almost a month before the beginning of the present affection by frequent *cramp-like pains* in the calf of the right leg upon walking a few (five or six) blocks.

Physical examination, January 17, 1909, revealed induration of the tissues about the saphenous vein, from the ankle to the upper fourth of the leg. The distal portion presents a cord-like thickening, with scarcely any inflammatory signs. Higher up, however, the skin is adherent to the deeper hardened area, and is exceedingly tender to the touch.

The *dorsalis pedis* and *posterior tibial arteries* of both legs are *pulseless*, the femorals and popliteals can easily be felt to beat. The big toe of the right foot has a cyanotic hue.

Course.—January 31, his phlebitis was found much improved; his right big toe often hurts him; and his foot easily gets "cold" and "tired."

Two months later, March, 1909, no evidences of the old thrombophlebitis can be found. The big toe of the right foot still shows a peculiar bluish discoloration, and the absence of pulsation in the vessels is the same as before. *There are no trophic disorders*; the most striking phenomenon is the vasomotor disturbance in the big toe.

In short we have here an exquisite example of a combination of early manifestations of thrombo-angeitis obliterans (pain on walking, evidences of disturbed circulation) with attacks of thrombophlebitis in the territory of one of the saphenous veins.

Whereas pathologic proof of the correctness of the diagnosis—thrombo-angeitis—is lacking in the last case, we are fortunate in being able to include here the history of another patient in whom there were similar symptoms, and in whose amputated limb and exsected veins we found ample material for anatomical investigation.

CASE V.—M. K., 44 years, Russian Hebrew, father of three healthy children, was admitted to Mt. Sinai Hospital on December 8, 1908. His limbs never troubled him until about a year ago, when he felt the presence of tender spots on the inner side of the right foot. Soon other hard "lumps" and "cords" appeared; some of these in the neighborhood of the ankle, others higher up on the leg. After two months these disappeared, only to recur after a very short interval. Since then he has never been absolutely free from peculiar "painful spots," and, now, on admission, he still has signs of some of them. About three months after the onset of these symptoms he experienced pain in the big toe, especially on walking. This has become gradually worse, so that he has been unable to get about properly for almost two months. Of late he has often had cramps in the calf and instep of the right leg after walking for a short distance. His chief complaint, however, is the painful condition of the inner side of his right leg.

Physical examination showed evidences of circulatory disturbance in the right lower extremity. Both the dorsalis pedis artery and the posterior tibial were pulseless, although pulsation of both the femoral and posterior tibial artery could be easily detected.

Over the inner border of the right foot there is a red streak about one-half inch in length. This corresponds to a tender indurated mass which thins out and is lost as it is traced upward. A short distance below the middle of the leg the upper end of a hard cord can be palpated. This extends down behind the border of the tibia for more than two inches, is adherent to the skin, somewhat nodulated, and marks the centre of an area of hypersensitive, swollen, turgid skin. There are no trophic disturbances. *Diagnosis: thrombo-angeitis, and thrombophlebitis of the internal saphenous and some of its tributaries.*

On December 15, 1908, a portion of the thrombosed saphenous was removed for pathological examination.

On December 26, 1908, the physical examination was recorded as follows: In the horizontal position, the right foot has a light shade of red; this is most marked over the big toe, and fades off towards the ankle. In the web between the third and fourth toes there is a superficial ulcer. On the inner side of the foot almost two inches from the internal malleolus there is a hard, cord-like

nodule which is adherent to the skin. Behind the tibia there is the scar left after removal of a portion of the saphenous vein. The saphenous can no longer be felt.

On elevation of the foot blanching sets in rapidly and pain becomes intense. The pendent foot turns very red (marked erythromelia).

FURTHER COURSE.—February 15, 1909, the pain in the foot has been getting steadily worse, and the fourth toe is beginning to turn black. On the 23rd of February *amputation at the knee* was done, at the request of the patient, for early gangrene of the fourth toe.

What additional information did the autopsy of the amputated limb furnish? The prognostication that was made clinically in regard to the condition of the long saphenous vein was confirmed, for, as was expected, practically the whole of the main trunk of this vessel was found converted into a fibrous cord, the result of an old thrombotic lesion. It would lead me too far to describe the pathological changes, and I shall refer to these later on in a summary of what was characteristic of all the cases. Here let it suffice merely to mention that the obliterative process had much in common with that form which is typical of disease of the deep vessels. As for the arteries, the plantars, peroneal, posterior tibial, and lowermost portion of the popliteal were completely occluded by the brownish organized tissue usually encountered in the disease under consideration; whilst the deep veins were patent throughout.

For clearness, then, let us state our observation succinctly as follows: The case is one of *thrombo-angeitis obliterans*, in which the symptoms manifested themselves first in the form of migrating phlebitis that has persisted almost the whole of the year's course of the disease. The thrombotic lesion has affected the right leg and is associated with the development of typical symptoms of thrombo-angeitis. At the end of the year some of the deep vessels are closed, for there is absence of pulsation in the dorsalis pedis and posterior tibial. For a long time there are no trophic disturbances, but finally in the thirteenth and fourteenth month of the disease ulcers develop and dry gangrene of one toe leads to amputation of the limb.

Still more interesting and instructive are those cases in which the disease of the superficial vessels affects both legs and one or both thighs and in which the signs of—

IV. BOTH MIGRATING PHLEBITIS AND THROMBO-ANGEITIS PLAY
EQUALLY IMPORTANT RÔLES IN THE SYMPTOM-COMPLEX

Case VI will illustrate this variety. The patient could be observed for almost a year, the progression of the obstructive changes in the deep vessels could be closely followed by proper interpretation of the varying circulatory phenomena in the leg, and many of the attacks of thrombophlebitis in the territory of at least one saphenous vein could be recorded.

CASE VI.*—H. R., 32 years, Russian Hebrew, admitted to Mt. Sinai Dispensary August 9, 1908; has been suffering for five years. At first it was a burning sensation in the toes of the left foot that gave him most concern, but later on he was troubled more by his inability to walk distances, on account of the sudden advent of attacks of pain that were felt from the toes upward almost to the knee. In cold weather he seems to be in poorest condition, for then his toes get cold and blue and walking is very difficult. Although this has been going on for years, he has not found it necessary to consult a physician until something else in his *right leg* began to engage his attention.

For the last five months long "*streaks*" or "*swollen places*" would come and go over the inner side of the right leg, behind the shin bone. These are often very painful. A week ago a physician told him that he had "*phlebitis*."

Physical examination on August 17, 1908: The vessels of the right leg pulsate, but the left posterior tibial and dorsalis pedis cannot be felt.

The right leg shows a tender cord with some *œdema* around it, extending from the ankle almost to the tibial tubercle. This corresponds to the long saphenous. Erythromelia is definite on the left side; there are no trophic disturbances, and the circulation of the right leg is fairly good.

From now on, aggravation of his subjective condition went hand in hand with the advancing lesions in the vessels. That an increase in the extent of vascular occlusion took place from this time on could be easily deduced from clinical observation.

* I wish to express my thanks to Drs. Mannheimer and E. Moschcowitz for their kindness in referring this case to me.

On December 1, 1908, I have recorded the following: The right foot looks pale (evidence of the beginnings of circulatory disturbances). After a short time it becomes slightly cyanotic. It looks cadaveric when raised for a short time. There is no erythromelia. The dorsalis pedis does not pulsate. A tributary of the long saphenous about two inches long can be palpated as a tender cord along the lower inner aspect of the right thigh; the skin over it is reddened. There are two nodosities in and under the skin below and to the inner side of the tubercle of the tibia. The left leg shows marked erythromelia; blanching in the elevated position is extreme; the popliteal is open but the dorsalis pedis and posterior tibial arteries cannot be felt. There are no ulcers or other signs of trophic disorder.

The steady advance of the occlusive process in the deep vessels is well illustrated by the findings on December 1, 1908. In August, all the vessels of the right lower extremity pulsated in normal fashion; now in December the dorsalis pedis is occluded. Corresponding with this there is a new symptom, the blanching of the foot. How remarkable that the disease of the deep vessels on the right side should be so closely associated with the attack of migrating phlebitis, the latter first attacking the saphenous in the leg, and now appearing in the thigh! We have evidences of chronicity in the affection of the superficial veins, and, as regards the deep lesion, we have been able to watch its gradual development both by its effect on the palpable arteries and by the clinical manifestations it has produced.

On January 31 the big toe of the left foot was swollen and red; the nail was coming off. Immediately upon removing his shoe, the right foot had a very white color, but soon cyanotic patches mingled with the pallor all over the foot, especially in the region of the big toe. The pain in the left foot was now excruciating and he consented to an amputation with scarcely any reluctance. The left leg was amputated at the upper fourth.

Examination of the vessels of the amputated limb showed occlusion of the following arteries: dorsalis pedis, peroneal, plantars, and posterior tibial. The anterior tibial artery was open throughout most of its course. A large part of the long saphenous vein was found occluded by an organizing thrombotic process. *Diagnosis: thrombo-angeitis obliterans.*

In short, our patient presents the following features of interest: (1) migrating thrombophlebitis of both saphenous veins; (2) involvement of the same vein in its course through the thigh; (3) associated progressive and synchronous development of the thrombosis in the superficial and deep vessels of the right lower extremity; and (4) absence of any cause for the lesion of the superficial vessels.

From the consideration of the data thus far presented, it would appear that the internal saphenous vein is the site of predilection for that peculiar endo- and perivasculär lesion which we have termed a **migrating phlebitis**. In July, 1904, I had the opportunity of studying a case in which the veins of the upper extremity too were involved. Since then two more patients with a similar distribution of the lesions have come under my observation, so that I may consider all three in one group.

V. MIGRATING PHLEBITIS OR THROMBOPHLEBITIS INVOLVING BOTH UPPER AND LOWER EXTREMITIES

In all three patients the disease has reached that stage of chronicity in which the suffering is almost constant and in which the limbs may be regarded as irretrievably lost. For there are cases that become "cured" as far as symptoms are concerned. And by "cured" in this sense we do not mean to imply that the pulseless dorsalis pedis, posterior tibial, or both, begin to beat again, but rather that, in spite of closed vessels, an adequate collateral circulation has become established, as evidenced both by the absence of the typical manifestations of impaired circulation, and by the patient's improved subjective state. The patients under consideration *per contra* have the "severe" form of the disease, even though the issue, gangrene, be delayed far beyond our expectations.

CASE VII.—B. B., 34 years, Russian Hebrew, married, has no children; operator for eleven years. His malady began eight years ago, when he first experienced pain in the right calf on walking. He would be compelled to rest after walking four or five blocks. At about the same time he often noticed that there were long "hard cords" and "reddened lumps" over the front of *both forearms* (anteriorly) and over *both legs*. These would come and go, appear without provocation, now in an arm, now in a leg. The lumps were always small, pea-sized or slightly larger, and could be felt for two or three days.

He always felt better during the summer months. The nodules in the legs were present almost every winter for the first five years. Six years ago there was a "bad attack," in the course of which there were ("Adern") "veins" or "nodules" behind and above the right ankle. Then again, about three years ago, there was a repetition of this trouble. Nodosity formed behind the shin bone on the inner side of the right leg (region of saphenous) and the pain kept him abed for almost ten weeks.

Thus, up to this time, he complained of the following: pain in the right calf on walking two to four blocks, painful nodules and cords, and cramps in the toes and sole of the right foot at night.

For two years the left leg has given him concern; the condition is practically the same as that of the right. Last winter, January, 1909, there were "sores"—one at the tip of the big toe of the left leg, and another at the end of the little toe of the right. He feels best when his legs hang down (a variation from the usual statement); but even in this position the toes often feel "dead." In the same way his fingers get "numb" in winter; he thinks that there is no blood in them.

Physical Examination.—In the right leg, the toes have a tense, reddened appearance, the second and third being discolored most, the little toe having a cyanotic hue. Just behind the nail on the plantar surface there is a deep fissure, the tips of which are adherent. Slight pressure brings forth a drop of pus from the bottom of the wound. The erythromelia is marked over the dorsum of the foot as well as over the sole. Ischaemia in the elevated position is intense; this posture excites severe pain. The femoral artery pulsates; the popliteal, posterior tibial, and dorsalis pedis cannot be felt.

The left leg is similarly affected; the erythema is deeper and the toes are more swollen. There is a trophic ulcer at the tip of the big toe. The ischaemia, too, is of a greater degree. All the vessels (femoral included) fail to pulsate.

Summary.—This is a case which according to the story combines thrombo-angiitis with migrating phlebitis of both upper and lower extremities. There are at present no evidences of involvement of superficial veins.

One of the most instructive of the cases of my series is a patient

in whom the attacks of inflammation and thrombosis of superficial veins dominated the clinical course for years before the symptoms characteristic of thrombo-angeitis obliterans came into evidence.

CASE VIII.—D. B., 35 years, Russian Hebrew, first seen by me July 16, 1904, when at Mt. Sinai Hospital. He had been treated in the hospital eight years previously for "phlebitis" of the right leg; a portion (5 inches) of a large vein was diseased at that time, and the history states that the process was "migrating," moving up and down the thigh. He says that this trouble lasted off and on for two years.

One year ago (1903) there were "lumps" in and under the skin of the right leg, and then three months later in the left leg. Such swellings would last a week, develop into hard "tender spots" with a covering of red skin, and on one occasion three such spots appeared on the left arm in front of and just below the elbow.

Physical Examination, July, 1904.—In the left antecubital region there is a thickened, slightly reddened cord about two inches long. Another is situated on the ulnar aspect of the same forearm near the elbow. The right forearm presents a similar vein about three inches from the elbow; the skin is not reddened. On the inner side of the right cubital space a subcutaneous adherent nodule can be felt; it is very tender. There are several such nodules in the right calf and smaller ones over the left shin bone. No edema, but slight cyanosis of both legs in the pendent position. A portion of one of the thrombosed arm veins was extirpated for study.

Course.—A year later, 1905, symptoms referable to affection of the deep vessels of the left lower extremity manifested themselves, to wit: coldness and blueness of the left foot and superficial ulcers on the toes.

Thus far our patient presented no striking addition to the symptom-complex under discussion, other than the thrombophlebitis of the arm veins. In 1907, however, he developed a gangrenous patch at the tip of the middle finger of the right hand. This rather unique site for trophic manifestations is rarely seen in obliterating thrombo-angeitis, and therefore deserves more detailed mention.

On February 1, 1907, D. B. consulted me at the Good Samaritan Dispensary. His doctor had been treating him for a "felon" of the middle finger of the right hand. His hand had been cold for

several weeks. Four weeks ago a black "dead" spot formed on the tip of the finger, and since then, what with cutting it, and self treatment, he thought that the present intensely painful affection had overtaken him.

Physical Examination (February 1, 1907).—A portion of the tip of the middle finger is gangrenous; there is no infection; the distal phalanx seems to take part in the process of mortification. On the dorsum of the hand, just over one of the veins, there is a bean-sized indurated area; the skin over it is adherent and tender. About one inch above the wrist, behind the radius, there is a reddened hard cord, more than an inch in length (doubtless a thrombosed vein).

The left foot is bluish, and there are a number of red nodosities in the leg. They are placed over the course of the long saphenous vein, one or two inches above the tip of the malleolus, and a couple of others 3 to 4 inches above the ankle. The right leg shows a thrombophlebitic, indurated process over the lower part of the anterior tibial group of muscles.

Further Course.—The finger improves very slowly; in April it is healed. The nodules in the upper extremities disappear after three weeks. April 16, 1907, over the outer side of the right leg, four inches below the tibial tubercle, the skin and subcutaneous tissues are indurated. There are two hard areas further down. The nodosities come and go, now in the right, and now in the left leg. On April 29, 1907, his left foot troubles him greatly. It is slightly swollen; the toes become deep red in the dependent position. The right foot is slightly red in the same position. Both femorals and popliteals pulsate well. On June 1, the left foot is very painful; the toes feel as if needles were sticking them.

November, 1907.—Since the beginning of September the right leg seems to be affected by the same disease as the left. New nodules of subcutaneous infiltration have appeared on the inner side of the left leg and the inner side of the right knee. They seem to have very little tendency to disappear. He often has pain in the middle finger of the right hand, and this hand is colder than the left.

Physical Examination.—On holding both hands above his head, the right becomes blanched. When the hands hang the right becomes cyanosed; there is an admixture of red, so that there is a

mottling of red and blue (erythromelia of the upper extremity). Both radial pulses are good. *Lower Extremities.*—On the inner aspect of the right leg three nodules are seen, two near the tubercle of the tibia, a third, one inch behind the middle of the crest of the tibia. They are $\frac{3}{4}$ to 1 inch in diameter, involve skin and subcutaneous tissues, and are red. Similar infiltrations are found on the inner side of the left leg—two in the middle and upper third; two others, four inches above the ankle. They evidently follow the course of the saphenous vein. The right foot has a bluish-red color. The left is even more markedly discolored; the second toe is enlarged, looks angry, and presents a small superficial ulcer near the nail. On December 19 (a warm day), the legs are red when they hang down. There is no cyanosis. Both feet become cadaveric when raised. A new cord has formed over the right wrist; it is about an inch long and lies over the radius; a somewhat longer cord is situated over the inner side of the right knee. (Salicylate of mercury injections are administered.) On January 3, 1908, the dorsalis pedis and posterior tibial arteries are pulseless. On February 7, he still has the painful cord over the right wrist, although he has had seven injections of mercury. The right popliteal pulsates, the left pulsates faintly; both femorals are open.

By September 7, his right foot is worse than the left. The dorsalis pedis and posterior tibials of both legs are evidently closed. At this time the right popliteal does not pulsate; the left beats faintly (note that this corresponds with the aggravated subjective sensations of the leg); both femorals are felt. Recent ulceration has occurred in the web between big and second toe of right foot. The toes are intensely red in the dependent position. On November 19, in the horizontal position both feet possess a marked erythematous hue.

On April 13, 1909, the patient came to the hospital for the ulcerated condition of both feet; he cannot walk. Over the dorsum of both feet there are superficial ulcerations, and there are a number of trophic ulcers in the webs of several of the toes. Under rest in bed and local treatment all the wounds heal. By June 9, both legs are in a condition of chronic erythromelia, even in the horizontal position. The feet have a dusky red hue; in the pendent position there is an admixture of purple. The skin is shiny and appears

thinned, although the toes themselves are enlarged. Only the femoral arteries pulsate; the ischæmia in the elevated position is very marked; all the superficial ulcers have healed.

Summary.—The total history up to the present time extends through a period of about twelve years. During the first eight years the clinical course was characterized by repeated attacks of migrating phlebitis of the superficial veins of the upper and lower extremities and the appearance of cutaneous nodosities, due in all probability to circumscribed venous thromboses. These attacks were accompanied by the usual pain and tenderness, some œdema, and secondary cutaneous manifestations. Towards the end of the first period, the prodromal indefinite pains of typical thrombo-angiitis were noticed. These were followed by the development of marked erythromelia of the left lower extremity, and of trophic disturbance. Then came a cessation of the process on that side, only to give way to a similar diseased condition on the right side, where it has caused obliteration of the distal vessels and the popliteal. In short, a period of occlusion of superficial veins was followed by a period of arterial occlusion which attacked first the left and then the right leg.

Does the paroxysmal nature of the involvement of the superficial veins throw any light on the sequence of events in the deep vessels? From my previous pathological studies⁴ it seemed most plausible to assume that certain territories of either arteries or veins become rather suddenly thrombosed, after a fashion similar to the thrombotic process occurring in the superficial veins of the lower extremities. Fig. 1 well illustrates the pathology of the posterior tibial vessels of one of my cases, showing the great differences in the age of the obturating tissue. The thrombus in one of the *venæ comites* is of very recent date; the closure of a small satellite is somewhat older; and the posterior tibial artery and the other accompanying vein have evidently been blocked for a very much longer period of time. The history of my ninth case is exceedingly illuminating on this point, since it suggests that attacks of migrating phlebitis of one leg may occur synchronously with paroxysmal pains in the other leg; and that these latter pains are closely associated with other signs clearly pointing to an exacerbation of the thrombotic lesion in

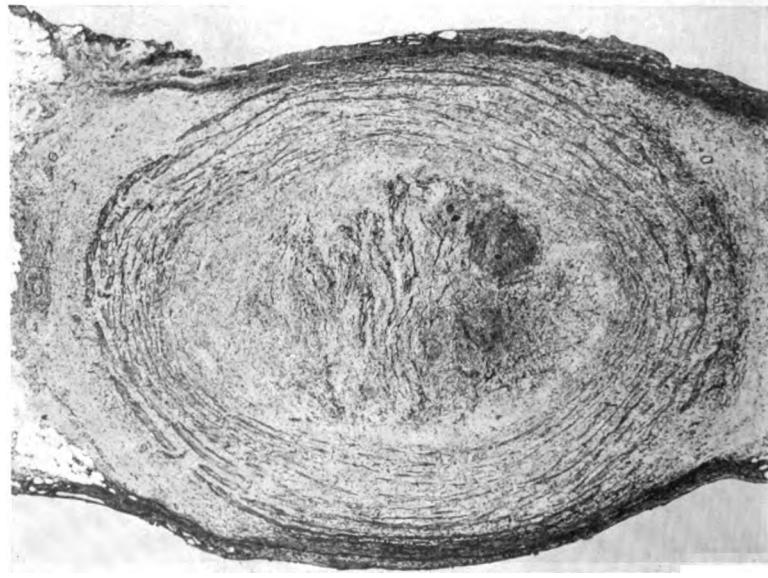
⁴ American Journal of Medical Sciences, October, 1908.

FIG. 1.



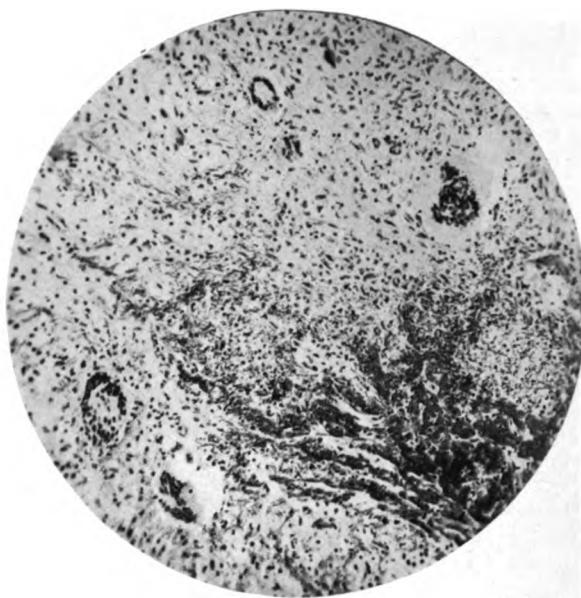
Various stages of occlusion of arteries and veins in thrombo-angiitis obliterans. Above, a vein recently closed; in the centre and below, old occlusions in an artery and vein; between the upper two vessels a satellite vein showing the intermediate type of obturation.

FIG. 2.



Recent thrombophlebitis; section of an arm vein. Case VIII. Note military foci in the obturating thrombus, early stage of organization, and infiltration of media with leucocytes.

FIG. 3.



Giant-celled military foci in an organizing venous thrombus. The type of giant cells is shown. The dark area represents masses of fibrin and blood cells.

the deep vessels—"an attack (if we may so regard it) of thrombo-angeitis obliterans." In other words, it seems more than likely that, at any given time, the patient may be suffering from a more or less acute disturbance in the course of which both superficial and deep vessels become closed.

CASE IX.—M. P., 34 years old, Russian Hebrew, admitted to Mt. Sinai Hospital in May, 1908. My history was taken on May 24. Two years ago there were some "swollen places" on both legs, and he had pain in the legs when he walked. One year ago he had attacks of "phlebitis;" this was the diagnosis at the Presbyterian Hospital. The veins on the inner side of the left forearm and arm, almost up to the armpit, were painful. The left saphenous at the middle of the leg was also diseased at that time. He had been treated at Mt. Sinai Hospital in August, 1907 (service of Dr. Manges), for "phlebitis migrans." At that time no suspicion was entertained as to the existence of the condition, thrombo-angeitis obliterans.

Last winter he often had pain in the feet on walking, and this has been much worse for the past four weeks. During the last two months the symptoms of phlebitis have recurred in the left leg and the left arm.

Present History.—For four days he has had excruciating pains in the calf of the right leg, even when in bed. Besides this, he has painful cords and "spots" in his left leg.

Physical Examination.—Both radials pulsate. The patient seems to be very restless because of the pain in his right leg. In the right leg, neither the dorsalis pedis nor the posterior tibial artery can be felt; the popliteal artery is patent. The toes are slightly red in the horizontal position; there is marked erythema of the toes in the pendent position. Ulcers and thromboses are absent. (Note made May 24: The pain in this leg must be interpreted as suggesting thrombosis of the deep vessels, because there is nothing else to account for his suffering; apparently no neuritis.)

In the left leg also, absence of pulsation in the dorsalis pedis artery and posterior tibial artery is noted. Just behind the tibia, at the middle of the leg, the saphenous vein is thrombosed, being adherent to the skin, which is reddened. There are a number of nodules in its vicinity, probably corresponding to small tribu-

taries. There is erythromelia of moderate degree, but no marked ischaemia in the elevated posture. The popliteal artery is patent.

In the left arm, a small portion of an anterior ulnar vein, low down, is indurated.

Briefly, then, the typical signs of bilateral thrombo-angiitis obliterans, without trophic disturbances, varicose veins, or infection, are associated with attacks of thrombophlebitis of the superficial veins of the upper and lower extremities.

On May 28, 1908, the pain in the right leg is gone, the cords are disappearing, the ulnar thrombosis is no longer palpable.

I saw the patient again on December 1, 1908. After leaving the hospital he could walk but a block without stopping for a rest. For about two weeks a new longer cord has travelled up from the middle of the inner side of the left leg, behind the knee, to the lower part of the thigh. There is another one behind the ankle and inner side of the foot. In the calf there are two tender bean-sized nodosities. He says that the big toes always feel as if they were asleep, and he often has an inclination to rub them to dissipate the feeling of numbness. Examination shows his condition to be slightly worse than it was in May, as regards sufficiency of circulation in both legs.

On June 15, 1909, he was again examined by me. He was then a pitiful spectacle to behold. Pulling himself along on two crutches, with an expression of fear written all over his face, lest the contact of the soles of his feet against the ground call forth excruciating pain, with the aid of his wife he finally seats himself, telling me the following story: He has tried "everything" for his legs. He has been treated in other hospitals since I last saw him and now he cannot walk at all. The big toe of the left foot hurts him unbearably, and his physicians are unable to ward off the coming of those dreadfully painful "sores" and "fissures" that form without reason on the soles, between the toes, and near the borders of the nails. He cannot bear his weight on the legs at all. The effort to walk was soon given up and he has permanently assumed the horizontal position as the only one possible to be borne.

Physical examination showed intense erythromelia of both feet, with a slight cyanotic hue, as in Case VIII, D. B. The middle portion of the internal saphenous vein for about an inch of its course

through the leg is converted into a hard tender cord. There is a nodosity 0.5×1 cm. three inches below the left tibial tubercle and two inches outside of the crest of the tibia. All the toes of both feet are somewhat enlarged; they look stiff and turgid when held in the dependent position. The blanching of the raised feet is extreme.

Resumé of Case IX.—Recurring thrombophlebitis migrans of both upper and lower extremities, gradual development of the severe chronic clinical type of thrombo-angiitis obliterans without gangrene, symptoms indicating the simultaneous paroxysmal attack of superficial and deep vascular channels.

Pathology.—In the space allotted to me it would be impossible to detail the minutiae of the pathological lesions and to discuss at length the points of resemblance and difference between the thrombotic processes in the deep and surface vessels. I shall therefore dwell upon this phase of the subject no longer than is necessary to mention some essential features, leaving a critical study of the same for some future publication.

The microscopic picture presented by the exsected superficial veins varies in type just as I have elsewhere described it in the deep vessels.⁵ This depends in great part on the age of the occlusion—whether the vein be studied soon after the filling of its lumen with red and mixed clot, or at a time when organization has become advanced. In general, however, we may speak of two types of thrombophlebitis. In the one there seems to be quite an acute inflammatory process. All the coats of the vessel are infiltrated with polymorphonuclear leucocytes, the lumen is distended with clot, and the process of organization is a rapid one. Soon miliary giant-cell foci as shown in Figs. 2 and 3 form, for the most part in the peripheral portions of the thrombus. The giant cells usually lie near the outer portions of small collections of fibroblasts or endothelial-like cells, often enclosing fibrin or masses of broken-down cells and polynuclear leucocytes. Later on the lumen is converted into a mass of dense connective tissue in which vessels are represented either by capillaries or larger canalizing sinuses. There is regularly a marked periphlebitis. The second, or more bland or milder type of phlebitis—if I may thus style it—shows little in

⁵ *Loc. cit.*

the way of acute inflammatory process. There is obliterating thrombosis with organization and a mild periphlebitic proliferative process.

On the whole there is sufficient resemblance between the histopathology of the lesion of the deep and that of the superficial vessels to make it more than probable that we are dealing with one and the same disease. Further studies, however, are needed definitely to decide this important question.

Let us briefly outline the significant features of the clinical data offered by our nine cases.

1. The disease thrombo-angeitis obliterans is often associated with thrombophlebitis of superficial veins of the arms and legs.

2. Certain peculiar cutaneous nodosities are characteristic manifestations in many of the cases.

3. The disease of the superficial veins may be subsidiary, or it may dominate the clinical picture. Objective signs referable to these vessels should be regarded as extremely suspicious marks of the synchronous development of thrombo-angeitis obliterans. In the presence of migrating phlebitis or cutaneous nodosities we should carefully search for evidences of thrombo-angeitis obliterans, in the form of pulseless vessels, erythromelia, blanching of the leg in the elevated posture, cold and blue toes, pain in the calf of the leg brought on by walking, and other typical phenomena.

4. Migrating thrombophlebitis may give no symptoms, the signs referable to the deep vessels being of most importance.

5. Patients may suffer at one time from the migrating thrombophlebitis, at another from the progress of occlusive change in the deeper vessels.

6. One of the cases suggests the possibility that attacks of trouble in surface veins may occur simultaneously with similar exacerbations of disease in deep vessels of another limb.

7. The morbid process resulting in the production of cutaneous nodosities and thrombosed superficial veins is independent of varicosities, of infections, or of trophic disorders in the territory which they drain.

8. Many scattered clinical data, and the history of one case, indicate that the vessels of the upper extremity may be affected by

^a None of my patients had varicose veins.

the lesion thrombo-angiitis obliterans. In the absence of material for study, such as an amputated upper extremity, the condition of the deep vessels of the arms is still unknown to us. The radial artery, however, certainly does not seem to be involved in any of the cases, although the occurrence of thrombophlebitis is fairly common.

9. Thrombophlebitis in the arm and forearm should arouse our suspicions as regards involvement of the deep vessels of the legs.

10. Further studies should be directed towards solving the relationship between the two thrombotic lesions that we have described. Perhaps excision of nodules and veins early in the disease, exploratory incision for inquiry into the condition of the deep vessels, and bacteriological and serum investigations along the proper lines, will do much to enlighten us in our interpretation of this most puzzling symptom-complex. Although absolute proof is lacking, it seems more than probable that the same determining causative factor is responsible for the lesions of both the superficial and deep vessels.

I wish to acknowledge my indebtedness to Dr. F. S. Mandelbaum for the photomicrographs; to express my thanks to the members of the attending staff⁷ of the Mt. Sinai Hospital, through whose generosity I have been allowed to follow some of the cases; and to Miss Adèle Oppenheimer, volunteer assistant in surgical pathology, for her unremitting endeavors in behalf of a reliable collation of facts.

⁷ Drs. Gerster, Lilienthal, Sachs, Brill, Rudish, Myer, and Manges.

Surgery

EXOPHTHALMIC GOITRE FROM THE STANDPOINT OF THE CLINICAL SURGEON

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IN order to include as much as possible of the vast subject of exophthalmic goitre in this limited paper, only such portions will be discussed as must be uppermost in the mind of the clinical surgeon in order that he may give to the patient that form of treatment which is most likely to result in a safe and permanent recovery.

DIAGNOSIS.—From the standpoint of the surgeon the diagnosis of exophthalmic goitre in cases coming properly under surgical treatment is not a difficult matter, because no case properly belongs in this class unless treatment with rest, hygiene, diet, and internal treatment has either failed altogether or has failed to relieve the patient permanently of the disease. As early as 1786 Parry gave a clear description of the symptoms of this disease. This was repeated by Graves in 1835, and five years later, with great clearness, by Von Basedow, and since then innumerable times by hundreds of clinicians. The following may serve as a short, concise summary of the symptomatology:

SYMPTOMS.—(1) Exophthalmia; (2) tachycardia; (3) tremor; (4) muscular weakness; (5) nervous excitability; (6) vertigo; (7) Graefe's symptom—in directing the eye downward the lower margin of the upper eyelid does not follow the line of vision normally, but lags behind or follows in an irregular spastic manner; (8) Stellwag's symptom, retraction of the upper lid together with infrequent winking; (9) paroxysmal dyspnoea; (10) intermittent vomiting without apparent exciting cause; (11) intermittent dia-

rhœa without apparent exciting cause; (12) intermittent sweating without apparent exciting cause; (13) intermittent mental depression without apparent exciting cause; (14) psychic excitation increases the gravity of the condition; (15) physical or mental fatigue increases the gravity of the condition; (16) the administration of thyroid extract increases the gravity of the condition; (17) the administration of iodides increases the gravity of the condition; (18) in advanced cases there is practically always emaciation.

Any one or any group of these symptoms may be prominent early, while others, especially the goitre and the exophthalmos, may be late in appearing or may be developed to so slight an extent that they are only noticed after the examining physician's suspicion of the presence of the disease has been aroused by the presence of some of the less common conditions. The one symptom of tachycardia, however, seems to be present in every case.

Blood Examination.—Kocher¹ has found some fairly uniform conditions in the blood examinations made in cases of exophthalmic goitre, but these conditions are also present in a number of other diseases. There seems to be lessened coagulability of the blood. The polyneutrophiles had decreased from 75 per cent. to 35 per cent., while the lymphocytes had increased from 25 per cent. to 75 per cent. in individual cases on the day before operation, while on the day after, the neutrophiles increased from 42 to 89.2 per cent. whereas the lymphocytes decreased from 48 to 2.7 per cent. Kocher comes to the conclusion that there is an increase in lymphocytes and a decrease in leucocytes before the operation and *vice versa* after operation. He characterizes exophthalmic goitre as a hyperthyrosis with glandular hyperplasia, lymphocytosis, and lymphatic disturbances of the gland. The increase in lymphocytes, however, was more often relative than absolute, the total number of leucocytes being normal or rather low. His conclusions are based on careful blood examinations in 58 cases.

From the practical standpoint, however, it should be stated that the diagnosis has been made in almost every case a long time before the surgeon is consulted. Indeed, until very recently too

¹ Trans. Sec. Surg. and Anat. Amer. Med. Assoc., 1907, 370.

long a period has intervened between the original diagnosis and the surgical treatment in many of these cases. Too much stress cannot be laid upon the importance of an early operation in all cases in which a permanent cure is not obtained by internal treatment. This fact is most forcibly insisted upon by Kocher, Mayo,² and all other clinicians who have had a large experience in the surgical treatment of these cases, and one that should be impressed especially upon the family physician.

COMPLICATIONS.—Although much stress has been laid upon the complications affecting the nervous, the circulatory, and the digestive system, because these complications are directly dependent upon the disease, it must be borne in mind that exophthalmic goitre may be complicated by diseases of any portion of the body. Even myxædema has been described as a complication by Simonds Gooding,³ Faure,⁴ and a few others, although this condition is plainly the result of a lack of physiological activity of the thyroid gland, while exophthalmic goitre is supposed to be due to a hyperthyroidism, according to Kocher, or to a toxin caused by an excessive amount of normal or abnormal thyroid secretion, according to Moebius,⁵ while Oswald and a few others think there is a thyroid insufficiency. To my mind the description of pathological findings by McCallum⁶ is convincing of the fact that there is, indeed, always a condition present which must result in hyperthyroidism, no matter what the exciting cause may be, and this I think is plainly borne out by the clinical picture.

OPERATION.—In order to produce a clear picture of a reasonably safe operation in exophthalmic goitre, it may be well to describe the various steps successively, although this may seem superfluous to those who have themselves frequently performed this operation.

Preparatory Treatment.—It is important to prepare patients with a pulse exceeding 120 beats per minute, or those with a pulse which lacks uniformity, by absolute rest in bed, mild sedatives, a

² Trans. Amer. Surg. Assoc., 1908, **xxxvi**, 599.

³ Myxædema and Exophthalmic Goitre, Brit. Med. Jour., **i**, 1423.

⁴ Presse méd., 1899.

⁵ Basedowsche Krankheit, Vienna, 1896.

⁶ Trans. Sec. Surg. and Anat. Amer. Med. Assoc., 1907, 370.

meat-free but nourishing diet, quiet surroundings, and absence of all psychic excitation, which according to observations and animal experimentation by Crile⁷ is capable of producing hyperthyroidism by discharging in some way, either directly or indirectly, into the circulation an excessive amount of thyroid secretion, which in itself may cause death. Tepid baths and any other means of making the patient comfortable and contented are useful. If general anaesthesia is employed, this should be given so as not to excite the patient.

In order to prevent infection, two precautions are important: the careful covering of the patient's hair, and the guarding against infection from the mouth and nose. It is an easy matter for a patient to fill her own wound with infectious material from her mouth or nose if these are not under the careful supervision of some one assistant who gives his entire attention to this matter. If the operation is performed under cocaine anaesthesia this protection can readily be accomplished by placing a dozen thicknesses of sterile gauze in the form of a roller bandage over the patient's mouth and nose and around the head. The patient will be able to breathe through this, but the air expelled from the nose and mouth will be filtered on its way through these layers of gauze.

If ether is used for general anaesthesia, the patient should first be thoroughly anaesthetized while in the horizontal position; then the head of the table should be elevated to 39°, and the mouth and nose should be covered with gauze in the manner just described; then the operation can be completed without the administration of any further amount of anaesthetic, because the elevation of the head results in cerebral anæmia, and this in turn deepens the anaesthesia to such an extent that it will last until the operation is completed, if the latter is done with reasonable speed.

Operative Technic.—The curved transverse symmetrical incision of Kocher is now made with its convexity directed downward, its lowest portion being 2 cm. above the upper end of the sternum. The skin flap together with the platysma is reflected upward to a point just above the upper attachment of the sternothyroid muscles. These are now cut across at their upper end and reflected downward. This gives an excellent field of operation. It is now possible to

⁷ Trans. Amer. Surg. Assoc., 1908, xxxvi, 391.

grasp the superior thyroid vessels between two pairs of forceps and to cut and ligate both ends. In the meantime the superficial vessels which have been encountered have all been grasped between two pairs of haemostatic forceps and have been cut and ligated.

Having severed the superior thyroid vessels on the side on which an enlargement is found, or on which there are irregular nodules to which the disease has been attributed, it is an easy matter to dislocate the lobe forward. This brings into view the inferior thyroid vessels. These are again grasped between two pairs of haemostatic forceps, then cut and ligated.

At this point it is very important not to grasp the vessels too near their origin, especially on the right side, for fear of injuring the recurrent laryngeal nerve or the lower one of the parathyroid glands. Both of these structures are located between the thyroid gland and the trachea near this point, and both can easily be avoided if the above plan is employed.

The lobe is then dissected up, care being taken to leave the posterior portion of the capsule undisturbed, and with it the recurrent laryngeal nerve and parathyroid gland. The isthmus is now lifted up, and this exposes the inferior thyroid vessels of the other side. These should usually be treated precisely as those on the side which has just been finished, unless the disease is entirely confined to the one side. In most instances it is best to remove one entire lobe with the exception of the posterior capsule. The isthmus and about the lower half of the other lobe should usually be removed also, without disturbing the posterior capsule. This disposes of both inferior thyroid arteries and veins as well as the superior vessels on one side. During the entire operation all manipulations are made with the greatest gentleness, in order not to press contents of the gland into the circulation or into the wound for fear of causing acute hyperthyroidism. At the same time great care is taken to prevent hemorrhage, because Kocher has pointed out the toxic effect of blood absorbed by the wound surfaces. For the same reason great care is taken to stop any oozing into the wound after the operation.

The muscles are then carefully sutured in place in order to reduce the deformity to a minimum. A small drain is inserted through the lowest point in the wound, or, better still, through a

small opening 2 cm. below. The skin wound is closed with the greatest accuracy in order to prevent deformity.

By performing the operation in this systematic manner, the dangers to the patient are reduced to a minimum. Indeed, all of the recognized dangers are practically eliminated. Ether anaesthesia, which is permanently stopped before beginning to operate, removes all danger from this source. It also disposes of the danger from postoperative ether pneumonia, because the patient exhales practically all of the ether during the operation. The arrangement of the gauze bandage to the mouth and nose prevents infection from this source. Injury to the parathyroids and the recurrent laryngeal nerves is carefully avoided. The gentle manipulations of the gland and accurate haemostasis prevent difficulty from thyroid toxins, and the remaining portion of the gland prevents cachexia strumipriva.

There are, however, cases which are too weak to bear even this simple operation and yet seem to be unable to make further progress without operative aid.

In these cases it is well to follow the suggestions of Kocher, first to ligate one vessel under cocaine and after a few days another, until it seems safe to remove the diseased gland. Tuholsky, in an admirable paper, suggests the plan of preventing the toxic effect of thyroid secretion by ligating both superior and inferior thyroid veins. This plan is worthy of the attention of experimental research laboratory workers in this field.

STATISTICS.—For statistics the contributions of Mayo,⁸ Kocher,⁹ Crile,¹⁰ and Heineck¹¹ should be consulted. They show one very important practical point which I wish to emphasize in connection with many others, namely, that the operative mortality has decreased enormously, both with the accumulation of the total surgical experience in this field and with the accumulation of the surgical experience of each individual operator. In the history of all surgical progress, whenever this has occurred the time was near when uniform methods have become established.

The first patient with exophthalmic goitre upon whom I oper-

⁸ *Loc. cit.*

⁹ *Loc. cit.*

¹⁰ *Loc. cit.*

¹¹ *Illinois Med. Jour.*, 1908, xiii, 157.

ated has been perfectly well since 1895, a period of fourteen years. The patient was a young woman, aged twenty-two years, with typical symptoms becoming constantly worse under internal treatment. There were marked exophthalmos, severe nervous symptoms, only a moderately enlarged nodular lateral lobe, and marked tachycardia. Her pulse had remained above 140 beats per minute during several weeks of observation previous to operation. The rapid and permanent disappearance of all of these symptoms encouraged me to employ surgical treatment in all of those cases which did not recover permanently by internal treatment ever since that time. At that time this operation had scarcely obtained a foothold.

In the meantime, however, this subject has been taken from the field of experimental surgery and placed among the subjects which are looked upon as fairly well settled by all surgeons who have had an opportunity to accumulate a fair amount of clinical experience in this especial branch. This change has been accomplished especially during the last five years, through the investigations of the internist in the direction of diagnosis, by the physiologist in the study of living pathology largely through experimental work, and by the surgeon in simplifying the technic of surgical treatment. So thoroughly has this subject been studied that it may now be reasonably expected that the primary diagnosis will be made, that certain cases will be relieved permanently by internal treatment, that others will be improved only temporarily by internal treatment, and that this class will be subjected to surgical treatment at an early stage of the disease before the effects of the toxins have hopelessly impaired especially the muscles of the heart and the nervous system. It may then be expected that there will remain only a small proportion of cases that will not be benefited either by medical or surgical treatment, and that a still smaller proportion of the extremely violent cases will succumb to the disease without an operation, and only a very small percentage will die after operation.

Experience has shown that with early diagnosis and proper selection of cases the mortality of these cases after surgical operation is extremely small, and that this percentage is decreasing from year to year, so that it will be reasonable to expect an operative mortality of less than 1 per cent. within a few years in the hands of competent surgeons. In the same manner, unfavorable late re-

sults are sure to decrease, as already the most dreaded ones of these have been practically eliminated. We no longer encounter post-operative cases of cachexia strumipriva, tetany, or paralysis of the vocal cords, and but very rarely recurrence of the symptoms of the disease itself.

CONCLUSIONS

1. The diagnosis of cases of exophthalmic goitre suitable for surgical treatment is relatively easy and should be made early.
2. All cases of exophthalmic goitre which are not relieved permanently by rest, hygienic, dietetic, and medicinal treatment should be treated surgically before irreparable harm has been done to important structures.
3. This is especially to be borne in mind in connection with a class of cases that respond readily to non-surgical treatment only to relapse at once upon the slightest strain.
4. The dangers in the operation depend largely upon the harm done by the disease before the operation.
5. These dangers can be eliminated by early operation and by preliminary treatment with rest, hygiene, and diet.
6. The operative danger lies in the anæsthetic, sepsis, acute hyperthyroidism, tetany, cachexia strumipriva, injury to the recurrent laryngeal nerve, hemorrhage, and shock.
7. All of these dangers can be eliminated easily with reasonable skill and attention to details.
8. The patient should receive carefully directed after-treatment, with rest, hygiene, and diet, following the operation, until especially the blood and the nervous system and the heart have thoroughly recovered from the effects of the disease.
9. All psychic excitation should be prevented before and for a long time after the operation.

SOME POSTOPERATIVE COMPLICATIONS

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THE greatest danger to the surgical patient, and hence the period during which the experienced surgeon is most concerned, is not during the course of the operation alone, but also within the first few days or the week following it. A knowledge of the more frequent postoperative complications is absolutely essential to success in surgery. The most dangerous complications and hence those which require close observation for their early recognition and treatment are: (1) shock and collapse; (2) hemorrhage; (3) gastro-intestinal complications which cause vomiting, including acute dilatation of the stomach, postoperative ileus, and postoperative peritonitis; (4) pulmonary complications; (5) renal complications.

I. SHOCK AND COLLAPSE

Shock, as Crile has shown, is a general depression of the nervous system transmitted to the vital centres in the medulla, and resulting in exhaustion of the vasomotor centres. The effect of such a paralysis is that most of the circulating blood collects in the splanchnic area and causes a decided fall in blood-pressure. Collapse is due to sudden inhibition of the vasomotor centre due to a powerful stimulus. Both shock and collapse are due to overstimulation of the centre by afferent peripheral sensory or sympathetic nerve impulses. Collapse differs from shock in this respect only, viz., in collapse there is a sudden overpowering impulse which inhibits the vasomotor centre temporarily, while in shock this centre is in a state of exhaustion from a long-continued peripheral irritation. Shock is therefore most likely to follow prolonged operations, especially those upon the viscera of the upper abdomen. In the majority

of cases it appears within the first few hours after the operation. Quite rarely it may not show itself until twenty-four to forty-eight hours after the operation, and it is then called "delayed shock." When collapse following a severe hemorrhage has persisted for a considerable time, it begins to change into the condition of shock, as the vasomotor centre becomes exhausted in an effort to maintain the blood-pressure at the same level. True delayed shock is very rare, and may be explained by overstimulation during the operation, as, for example, by the anaesthetist giving strychnine for a pulse that is getting a little rapid. After the strychnine effect wears off, shock results from the overstimulation.

The symptoms of postoperative shock are the same as those of shock following an injury. They are: (1) Marked pallor and coldness of the skin and visible mucous membranes with cold sweat or moisture and a slight tinge of cyanosis. (2) A small, rapid, and irregular pulse. The increase in rate is proportional to the degree of shock. When the pulse-rate is 160 or over the outcome is usually fatal. (3) A stuporous or apathetic appearance of the patient. The mental dulness may vary from sleepiness to coma from which, in severe cases, the patient cannot be aroused. (4) Subnormal temperature, unless some other factor is present. The amount of depression depends on the degree of shock. The temperature may be down to 95°. When it is as low as 96°, the result is usually fatal. (5) Slow, shallow respiration, irregular in severe cases, Cheyne-Stokes in more serious cases. (6) Slightly dilated pupils, in severe cases widely dilated; they may even be immobile, not reacting at all to light. (7) Low blood-pressure practically constant. The amount of lowering is proportional to the amount of shock and varies greatly; in an ordinary case there is a fall of 20 to 30 mm., in severe cases even 60 to 70 mm. or more. (8) Involuntary urination and bowel movements. This is present only in severe cases; in children it may be present even in moderately severe cases. (9) Occasionally nausea and vomiting are present, but usually only at the onset of reaction. Repeated vomiting points to other causes, such as ileus, peritonitis, etc. (10) Reaction occurs after an interval, depending upon the severity of the shock and the treatment adopted. The pulse becomes slower and fuller, the skin becomes warmer. Consciousness and muscular power return, and

the patient often vomits during this period as the result of hyperæmia of the brain following the anaemia. If this reaction does not occur the patient's symptoms increase and lead to a fatal termination.

The above are the usual symptoms and constitute what is known as *torpid shock*. Rarely the patient instead of being mentally dull is excited and apparently very strong. He may struggle, shout, and attempt to get up. The reaction is accompanied by mental irritability or traumatic delirium (the latter is always a serious sign) or by muscular irritability causing intense restlessness. This form is the most difficult to treat and is usually fatal. This is known as *erethicistic shock*.

The prognosis depends on the degree of shock and on certain etiological factors as well as on the treatment instituted. Women stand trauma better than men. Children and elderly people are more apt to show signs of shock than adults, but recover quickly. The prognosis is best in adolescence and middle age. Those with organic heart or renal lesions, and especially the anaemic, stand shock less well than the healthy.

TREATMENT.—Here as elsewhere the most important point is prophylaxis. This includes:

1. *The Administration of Drugs.*—It has been found that a hypodermic injection of morphine gr. $\frac{1}{4}$ and atropine gr. $\frac{1}{150}$, given about half an hour before beginning the anaesthetic, will greatly lessen the degree of shock and reduce the amount of anaesthetic required.

2. *Maintenance of the Body Temperature.*—The patient should be exposed as little as possible; care should be taken that the patient does not lie upon a wet operating table. The towels and sheets which are used to cover the patient and surround the field of operation should be dry. After the removal of the patient from the table the body should be wrapped in blankets. In many of the more perfectly equipped hospitals these blankets are kept constantly warm in an ordinary laundry dryer. As soon as the patient is put to bed he should at once be warmly covered, and if the operation has been a prolonged one the patient is surrounded by hot water bottles, great care being taken to avoid direct contact of these with the skin.

3. Another important prophylactic point is to *avoid rough handling of the tissues*. Large nerves should be divided with a sharp scalpel, and all tissues, as far as possible, should be divided with some cutting instrument and not torn. Exposure of the intestines should be avoided by keeping them within the abdomen during the operation, and covering them with hot moist compresses. When it is necessary to search the intestines for a pathological lesion, only one coil at a time should be brought into the wound, and, after having been inspected, it should be returned and another brought out. It is now a well-recognized technical procedure in gastrointestinal surgery to eviscerate as little as possible and to surround the portion upon which the operator is working with hot moist compresses after it has been brought out upon the abdominal wall.

4. One should try as far as possible to *limit the loss of blood* during the operation. This will be referred to again under hemorrhage. Bleeding during operation may be quite extensive and the amount not be noticed by the operator or his assistant, until towards the end of the operation or shortly thereafter when the symptoms of shock appear as the result of this hemorrhage.

5. It is best to give very nervous patients a fairly large dose of *bromides or a hypnotic* the night before the operation to diminish the amount of shock.

6. Avoid as far as possible a *too rapid withdrawal of large amounts of fluid* from the serous cavities. It lowers blood-pressure greatly and may give rise to fatal shock.

The treatment of shock has changed considerably since Crile through his experimental work demonstrated that many of the stimulants hitherto given to combat did more harm than good in severe cases. Although of value in mild cases, these drugs overstimulate the exhausted vasomotor centres in severe shock and thus, by increasing the exhaustion, do not give the centres time to recover. If the heart be stimulated while the blood-pressure is still so low that the great venous trunks passing to the right auricle contain only a small amount of blood with which to supply it, the heart will only exhaust itself by beating more forcibly without being able to raise the blood-pressure or improve the circulation except momentarily. And, according to Mummery, to stimulate the heart to increased action when it has nothing to work on will only have the effect of hastening the time when it must fail.

Strychnine always causes a rise in blood-pressure, but it does so by forcing the already exhausted nerve-centres into action, and this will be followed by further exhaustion of these centres as soon as the effect of the strychnine wears off. If drugs like strychnine are given during profound shock, they often fail to be eliminated, remaining in the system, so that when the shock passes off the combined effect of all the stimulants will be produced, with perhaps a fatal result.

What has just been stated as true of strychnine is equally true of the other stimulants, such as alcohol, digitalis, and nitroglycerin. It is best, therefore, to avoid the use of stimulants in severe shock.

Morphine should not be given unless it is evident that pain is severe and increasing the shock. In general, it prolongs shock and should be administered with great caution.

Adrenalin is of the greatest value in the treatment of shock. It raises the blood-pressure in every stage of shock by acting upon the walls of the blood-vessels independently of the vasomotor centres. It will thus raise the blood-pressure when the vasomotor centres are quite exhausted, by re-establishing the peripheral resistance. It can be given hypodermically in doses of five minims of 1: 1000 solution every four hours; or, better still, it can be administered continuously by mixing it with normal salt solution in a dilution of 1: 50,000 to 1: 100,000. It is advisable to combine a little atropine with the adrenalin in order to avoid any depressing action of the latter upon the heart. The solution can be given either by the intravenous, subcutaneous, or rectal routes according to the urgency of the case.

Transfusion and Saline Proctoclysis.—This is of the greatest value in shock due to hemorrhage, but is of little use in that following prolonged operations or crushing injuries.

In hospitals the saline solution should be kept in flasks which are placed in a specially designed apparatus so as to maintain a constant temperature of 110°. In private practice every physician should keep on hand either the desiccated salt or the tablets which are sold by the various pharmaceutical houses for making salt solution rapidly.

If the shock is severe from loss of a large quantity of blood, the saline solution should be given by the intravenous route. The

directions for the administration of saline solutions by the various routes can be found in any of the standard text-books on surgery. The subcutaneous method is to be employed when the shock is less severe and there are no extremely urgent symptoms.

Proctoclysis, *i.e.*, the administration of the saline solution per rectum, is an extremely useful method in the less urgent cases.

In collapse, on the other hand, as the sudden fall of blood-pressure is due to a temporary suspension of the vasomotor centre by some very strong stimulus which temporarily overcomes it, and it is not due to exhaustion of the centre, stimulants are indicated and are of great value, *i.e.*, strychnine, etc.

II. HEMORRHAGE

Hemorrhage following an operation may occur *from the wound* itself in one of three ways: (a) As a result of imperfect haemostasis, either from ligating bleeding vessels too loosely or from not having secured a sufficient number of bleeding vessels, the temporary closure by clots being disturbed through movements of the patient. Subcutaneous veins and those of muscular structures are very apt to bleed after the patient has been placed in bed, unless the larger veins have been ligated. (b) As the result of constitutional causes. In this group belong those unavoidable hemorrhages which occur as the result of haemophilia and long-continued jaundice. (c) As the result of infection of the wound. The thrombi, which obliterate the cut ends of the vessels, become disintegrated as the result of purulent softening due to micro-organisms. This was formerly called secondary hemorrhage and occurred more frequently than it does at the present time, when septic infection is rare.

d. Haematemesis.—A number of cases have been described during recent years in which capillary hemorrhages have taken place into the stomach, after operations upon the appendix and gall-bladder. Such hemorrhages cannot be interpreted as the result of a faulty technic, but are in all probability the result of multiple infective emboli carried from the infected gall-bladder or appendix into the circulation, causing hemorrhage by rhesis of the smaller vessels of the stomach. These patients have recurrent attacks of vomiting which is brownish in color and shows the presence of blood by the appropriate chemical tests.

Von Eiselsberg in 1899 reported a number of cases in which it followed ligation of the omentum. The etiology of the condition is still a matter of dispute. The vomiting of blood begins within the first twenty-four hours after the operation, there being usually an interval between the vomiting which is due to the anaesthetic and the vomiting of haematemesis. Usually an ounce of intensely acid blood is vomited at frequent intervals, but in some the symptoms of acute dilatation of the stomach appear in which the patient vomits a brownish fluid in large quantities, say a pint or more at a time. The examination of this fluid reveals blood as the cause of the color. The general condition is similar to that of an intense toxæmia, with rapid, small pulse, and cold, moist skin. In some cases the acute gastric dilatation symptoms predominate with rapidly progressing collapse. The diagnosis presents no difficulty, especially if the black blood vomited at frequent intervals is accompanied by symptoms of toxæmia. The only condition with which it could possibly be confused is acute dilatation of the stomach. In this the vomitus is thin and brownish, and the symptoms of collapse appear much more rapidly. The enormous swelling of the upper abdomen with displacement of the lower viscera and the interference with respiration are also important diagnostic signs of acute gastric dilatation.

When the vomiting of blood occurs only once or twice in three hours the prognosis is rather favorable, but when the haematemesis occurs more frequently and continues for several hours the patient rapidly passes into a state of collapse, and death usually results within the first twenty-four hours.

Hemorrhage may take place after operations either (a) in such a way that it can be recognized at once by the reddish staining of the dressings, accompanied by the constantly increasing symptoms of acute anæmia, i.e., *external hemorrhage*; or (b) in such a manner that there may be no escape of blood from the wound or the latter may not be accessible to observation. The latter class of post-operative bleeding is apt to follow intra-abdominal operations or those upon the stomach, rectum, or bile-passages, and may be properly termed *concealed or internal*, since they can only be diagnosed by recognizing the symptoms characteristic of internal hemorrhage in general, viz., recurrent attacks of syncope, restlessness, pallor, and a rapid, empty pulse.

The diagnosis of the actual existence of the first clinical variety, viz., external hemorrhage, presents no difficulty. The blood is either seen escaping in large quantity or there is constant oozing which frequently resists all the ordinary methods of treatment. At times a gradually increasing haematoma may be the expression of this form of postoperative hemorrhage.

In cases where the hemorrhage is due to constitutional causes, such as haemophilia, inquiry into the previous history of the patient himself or of the family will often result in obtaining a history of frequently recurring obstinate hemorrhages after the slightest trauma.

Hemorrhage due to persistent jaundice almost invariably follows gall-stone operations, and may often be prevented by an examination of the coagulation time of the blood before operation, this being found to be much slower than normal.

Hemorrhage as the result of local wound-sepsis appears much later than either of the two preceding, and is accompanied by such marked local signs of infection that its recognition is not difficult.

The hemorrhage spoken of as concealed or internal is much more difficult to recognize than any of the above. It may follow any operation in a serous cavity, such as the brain, pleura, or peritoneum. In the brain the symptoms are those characteristic of cerebral compression. In the peritoneal cavity the symptoms resemble those following rupture of the Fallopian tube in an extra-uterine pregnancy, viz., gradually increasing pallor, soft, thready pulse, restlessness, and great thirst. Locally there are signs of irritation from the presence of free blood in the peritoneal cavity. These symptoms of peritoneal irritation are rigidity of the abdominal wall, at first localized, but gradually becoming quite diffuse, accompanied by tenderness on pressure and a moderate amount of tympanites (from paresis of the intestinal muscles). These symptoms are the same as those of beginning peritonitis, and their differential diagnosis will be considered later.

Hemorrhage may occur after operations such as gastro-enterostomy, or after operations upon the rectum, as for hemorrhoids, etc. The bleeding may take place into the lumen of the stomach or bowel in the former class of operations, or into the rectum in the latter. The early recognition of such cases is often impossible except from

the actual finding of blood, either vomited or passed with a bowel movement. The reason for this is that a movement containing blood may not occur till the patient is almost exsanguinated. The only manner in which to diagnose such a concealed hemorrhage before either a bloody vomit or a tarry stool occurs, is by watching for the ordinary signs of internal hemorrhage. These are (a) gradual or rapidly increasing pallor of the skin and visible mucous membranes (lips, gums, tongue, and conjunctivæ); (b) restlessness, often accompanied by delirium or stupor; (c) great thirst; (d) the pulse becomes soft and very weak, and rapid; (e) rapid fall in blood-pressure. The pulse-rate is not necessarily increased, since nature's effort to check the hemorrhage is by the gradual onset of syncope. When hæmatemesis or evacuations of large quantities of fresh or old tarry blood take place and are accompanied by these signs of anæmia, the diagnosis of concealed hemorrhage is not difficult. The question may be asked: How can the differential diagnosis of internal hemorrhage be made from that of beginning septic peritonitis? The answer is, that if the hemorrhage is not sufficiently marked to produce signs of general anæmia, a differential diagnosis in the early hours is impossible. Later on, *i.e.*, after six to twelve hours, the continuation and increase in quantity of the peritoneal symptoms, unaccompanied by those of general anæmia, indicate septic infection. In some cases both sepsis and hemorrhage may be combined and the symptoms of hemorrhage in the early hours after operation be followed by those of peritonitis later. In general, it may be said that the signs of internal hemorrhage appear soon after an operation, *i.e.*, in the first six hours, while those of infection occur at a later period, say twenty-four to forty-eight hours after an operation.

A gradual fall in blood-pressure accompanied by a steady decrease in the percentage of hæmoglobin and the number of red blood-corpuscles, is also an aid in distinguishing hemorrhage from postoperative peritonitis.

The prophylaxis of hemorrhage is very important. Patients exhibiting the above-mentioned etiological factors of hemorrhage, *viz.*, intense jaundice, a history like that of hæmophilia, etc., should be given calcium chloride gr. xv, three times a day seven to ten days before the operation. Icteric patients should not be operated

on if the coagulation time is over five minutes unless there is some urgent indication.

When the dressings are seen saturated with blood they should at once be completely removed and the source of the bleeding sought. If from an artery it must be found and ligated. If from a vein all compression above the wound must be removed, and a pressure bandage applied over the wound. This will also usually stop capillary oozing. When these measures are unsuccessful, or if the hemorrhage is concealed, the patient will have to be anæsthetized and the source of the bleeding found and controlled, by one of the usual procedures.

As regards the general measures to be adopted the most important are: (a) The administration of stimulants, which are of great value, but should not be given until the hemorrhage is checked. They include keeping up the body temperature above normal, strychnine, and digitalin. (b) Lower the head of the bed and raise the foot of the bed; (c) bandage the extremities; (d) administer normal salt solution. This is the best and most certain aid. It may be given intravenously if the indications are urgent; or subcutaneously if the indications are not so marked. (e) Morphine is certainly indicated. (f) The internal administration of styptics, as calcium chloride, stypticin, ergotin, etc., may be of value if any special hemorrhagic diathesis exists, but otherwise are not to be recommended. The various local means for the control of hemorrhage need not be gone into in this article, as lack of space does not permit.

Treatment of Hæmatemesis.—In case of postoperative hæmatemesis the stomach should be washed out, using a 2 per cent. sodium bicarbonate solution at a temperature of 115°, until the fluid returns clear; and then a 1: 1000 solution of adrenalin chloride in normal salt solution. Nothing should be given by mouth.

III. GASTRO-INTESTINAL COMPLICATIONS

The most important are: (1) vomiting; (2) hæmatemesis; (3) acute dilatation of the stomach; (4) ileus. Vomiting after operation may occur at various periods, and the diagnosis of its cause rests upon three factors: (a) the length of time which has elapsed since operation; (b) the character of the vomitus; (c) the accompanying symptoms.

a. Length of Time after Operation.—If the vomiting is due to the anaesthetic, it usually occurs before the patient becomes fully conscious; *i.e.*, in the first twelve to twenty-four hours after operation. Ether and chloroform differ somewhat in this respect. If due to ether, the vomiting occurs usually before the patient regains consciousness and is of brief duration. It begins early and ends early. With chloroform the nausea and vomiting may begin immediately after operation, but more commonly they begin late, being delayed as long as twenty-four hours. Postoperative chloroform vomiting is quite persistent, often lasting three or four days. If vomiting after ether anaesthesia persists longer than twenty-four to forty-eight hours after operation, other postoperative complications must be thought of and search made for their signs. One of the most frequent causes of prolonged postoperative vomiting is defective excretion of urea, and not infrequently uræmic complications are overlooked until too late to be remedied.

Persistent postoperative nausea and vomiting as symptoms of nephritic complications will be referred to under renal complications. Vomiting appearing later than ordinary postanaesthetic vomiting may be due to acute dilatation of the stomach, postoperative ileus, and peritonitis. The diagnosis can only be made in such cases from the character of the vomiting and the symptoms characteristic of these conditions.

Another cause of late postoperative vomiting is acid intoxication. Obstinate postoperative vomiting has frequently been observed following abdominal operations in neurotic individuals.

b. Character of the Vomitus.—The vomitus which occurs after ether or chloroform anaesthesia consists of either mucus or bile alone. The vomitus of haematemesis consists of very acid pure blood. In acute dilatation of the stomach the vomitus is a dark brown sour liquid, which attracts attention on account of the large quantities brought up at each effort.

c. The Accompanying Symptoms.—The vomiting due to ether or chloroform is seldom accompanied by other symptoms than those of vertigo or nausea. If it persists a number of days it is accompanied by great mental anxiety and depression, hollow sunken eyes, retracted abdomen, diminished excretion of urine, dry skin, etc. When due to postoperative nephritis, ileus, peritonitis, acid intoxic-

cation, or acute gastric dilatation the characteristic symptoms of these conditions are present.

Differential Diagnosis of Postoperative Vomiting.—When vomiting occurs after the first twelve hours it may be (*a*) the result of the anaesthetic; (*b*) due to acute gastric dilatation; (*c*) due to an acute duodenal obstruction (*gastromesenteric ileus*); (*d*) due to postoperative ileus; (*e*) due to a beginning general peritonitis. If the vomiting is due to the anaesthetic, it should begin to diminish in frequency during the second twelve hours after operation. In addition the vomitus consists simply of mucus with a small amount of bile. There is no abdominal distension, and when the high rectal tube is inserted or an enema is given the patient is able to expel flatus.

Acute gastric dilatation and *gastromesenteric ileus* cannot be differentiated, so they will be considered together. In both of these the onset of vomiting is preceded by restlessness. The vomiting begins within twelve to twenty-four or thirty-six hours after the operation. One of the most characteristic symptoms is the vomiting at each effort of large quantities (8 to 15 ounces) of sour brownish fluid. In a short time as large a quantity of the same fluid is vomited again, apparently without much effort. The patient's general condition is one of great anxiety and prostration, the lips are cyanotic, and the extremities cold and clammy. The respirations are labored and shallow and the pulse rapid and small.

Examination of the abdomen and insertion of a high rectal tube combined or not with the administration of an enema will soon clear up the diagnosis. In acute gastric or duodenal dilatation, the upper abdomen from the umbilicus upwards is greatly distended and percussion shows a marked tympanitic note. The area of tympany extends upwards to such an extent that there is scarcely a trace of cardiac dulness or of pulmonary resonance. This displacement of the heart as the result of pushing upwards of the diaphragm by the distended stomach explains the cyanosis, dyspnoea, and feeble heart-action. The lower abdomen is not distended as in a beginning postoperative ileus, neither is there rigidity and tenderness present as in a postoperative peritonitis. If the symptoms are the result of an acute gastric dilatation, rapid improvement will follow lavage of the stomach and turning the patient on his abdo-

men, and elevation of the foot of the bed. If the symptoms recur, as is often the case, repeated lavage will again give relief. If the high rectal tube is passed or an enema given, faeces or flatus will be expelled. In postoperative ileus and peritonitis there is early and absolute obstruction, no faeces or flatus being obtained through the use of rectal tubes or enemata. In postoperative ileus the vomiting is in smaller quantities and not accompanied by such an amount of dyspnoea, cyanosis, and collapse symptoms at first as in a gastric dilatation. The abdomen is more uniformly distended and negative results are obtained with enemata and the insertion of high rectal tubes. In postoperative peritonitis the abdomen is not distended as early as in ileus, but is uniformly rigid and tender and the pulse becomes much more rapid from hour to hour. Enemata and the insertion of the high rectal tube yield negative results as in ileus. In both ileus and peritonitis the vomitus is never in as large quantity nor as brown and sour as in an acute gastric dilatation, and the vomiting is more frequently repeated, and in ileus it gradually becomes *ercoraceous*.

Prophylaxis and Treatment of Postoperative Vomiting.—Certain measures may be adopted to lessen the liability of post-operative vomiting; among these may be included the thorough preparation of the patient so that his gastro-intestinal canal is well emptied, especially the stomach. No solid food should be given after the noon meal the day before the operation. The quantity of anaesthetic should be limited to the least possible amount and the duration of the anaesthesia should be reduced to the shortest time possible. All preparations should be completed before administering the anaesthetic, whenever possible.

In regard to drugs, atropine sulphate, gr. $1/200$ to $1/100$, given hypodermically one-half hour before anaesthetization lessens the tendency to vomiting. During the course of the anaesthesia any mucus collecting in the mouth should be carefully wiped away to prevent it from being aspirated or swallowed. At the completion of the operation and before the patient is put to bed it is often of great value to perform gastric lavage. Many surgeons employ this as a routine measure. The patient should be kept quiet in bed. Distressing vomiting may be relieved by a few ounces of hot water, tea, coffee, or champagne. Sometimes if vomiting continues a glass

of warm tea or water may be given. This will usually be vomited and the stomach emptied and no further distress follow. Lavage of the stomach with a dilute sodium bicarbonate solution and the administration hypodermatically of morphine sulphate, gr. $\frac{1}{4}$, will usually prove most efficacious. Other remedies suggested are chloroform water, cerium oxalate, bismuth subnitrate, and calomel in small, frequently repeated doses.

ACUTE GASTRIC DILATATION.—Acute gastric dilatation was formerly considered to be a very rare complication, but more recent observation has shown it to occur comparatively frequently. This latter view is the result of closer observation and earlier diagnosis. The generally accepted theory of etiology is that it is the result of a paralysis of the muscles of the stomach wall, either of central or local nervous origin; and it may follow any abdominal operation, especially those upon the gall-bladder and kidney.

The symptoms and diagnosis have been so fully considered under postoperative vomiting that they will not be repeated here.

Treatment.—The treatment consists of (a) immediate gastric lavage with sodium bicarbonate solution; (b) laying the patient on the right side or upon the abdomen and elevating the foot of the bed. It is well to give the patient morphine, gr. $\frac{1}{4}$, with digitalin, gr. $\frac{1}{100}$, hypodermically. The patient should be watched carefully, and if the distention, tympany, or vomiting recur the lavage should be repeated. This must be done several times as a rule.

GASTROMESENTERIC ILEUS.—A number of cases have been described by Finney, Codman, Albrecht, and others of a postoperative complication which has been called gastromesenteric ileus. Undoubtedly many cases of so-called acute dilatation of the stomach are in reality cases of gastromesenteric ileus, but these two conditions cannot be differentiated clinically. In gastromesenteric ileus there is obstruction to the lumen of the duodenum by the root of the mesentery and its contained superior mesenteric vessels. Whether this duodenal dilatation is primary or secondary to gastric dilatation has not been determined.

POSTOPERATIVE ILEUS.—This subject has attracted considerable attention, and various divisions have been suggested. The one hitherto accepted by the majority of surgeons has been that of Mikulicz into (a) mechanical; (b) dynamic. Finney has recently

suggested (*Annals of Surgery*, June, 1906) what seems a better classification; his division is as follows: (a) mechanical; (b) septic; (c) adynamic. While a distinction is very often impossible, the diagnostic features are generally as follows:

Mechanical ileus is characterized by a later onset, visible peristalsis, and severe colicky abdominal pains. The abdominal distention is asymmetrical, and at first there is no change in the pulse or temperature. Later the condition is characterized by persistent vomiting and constipation.

Septic ileus is often masked by general signs of septicæmia, thus differing in its clinical aspect from that of mechanical ileus.

Adynamic ileus develops as the result of paralysis of the intestinal muscles, with few signs of obstruction, and none of the signs of septicæmia. This, the most common form, usually appears about three or four days after the operation with the following symptoms. No bowel movement has occurred since the operation and none can be secured even by repeated enemata. Not even flatus is passed. There is general distention of the intestinal coils and great exhaustion, with subnormal temperature and feeble pulse. The difficulty of differentiating a case of acute postoperative ileus from an acute peritonitis is apparent, and the later the case is seen the more difficult does the differentiation become, for advanced cases of obstruction are almost always complicated by peritonitis. In both conditions the leucocytes are increased. In favor of the diagnosis of obstruction are a rapid, feeble pulse; a dry, pinched countenance; rapid distention of the abdomen, which is not board-like (except in adynamic ileus); increased peristalsis; early and severe vomiting, soon becoming fecal; severe cramp-like pain referred to the umbilical region; and absence of fever.

In some cases of postoperative obstruction, no symptoms appear until weeks or months after the operation.

There are other cases in which adhesions following an operation result in incomplete obstruction. In this class, especially frequent after appendiceal operations, the patients present a variety of symptoms. They may complain simply of abdominal pain, colicky in nature, accompanied by more or less abdominal distention and constipation. In other cases there is the history of colicky pains, accompanied by nausea and vomiting recurring at irregular inter-

vals. A form of postoperative ileus of the mechanical type to be especially mentioned is strangulation of a loop of intestine in a post-operative hernial opening. This may occur months or years after an operation. The differential diagnosis has been considered under acute dilatation of the stomach.

The *prognosis* is always serious. If not early recognized and properly treated the outcome is often fatal. The cause of death is either a toxæmia from the colon bacillus, or changes in the central nervous system.

The *treatment* depends on the variety and differs in no wise from that of ileus not following an operation.

IV. PULMONARY COMPLICATIONS FOLLOWING OPERATIONS

The increased frequency of these of recent years has directed the attention of surgeons not only to their early recognition, but to the study of their causes and prevention. The tendency to get patients out of bed earlier or allow them to sit up earlier has diminished the percentage of pulmonary complications. The frequency with which the various forms of postoperative pulmonary complications occur and their relative influence on results are well shown in a recent publication of Bibergel.¹ He found 282 pulmonary complications, *i.e.*, 7.2 per cent., in 3909 abdominal operations from Körte's clinic. Of these 815 were operations above the umbilicus; 2625 were operations below the umbilicus; and 469 were operations both above and below the umbilicus. These complications were:

	Number.	Mortality.
1. Pneumonia (lobular, lobar, hypostatic)	135	1.1 per cent.
2. Pulmonary embolism	12	0.3 per cent.
3. Pulmonary infarcts	9	11.0 per cent.
4. Bronchitis	82	
5. Pulmonary abscess	12	
6. Dry pleurisy	3	
7. Pleurisy with effusion	16	
8. Empyema	13	
<hr/>		
9. In addition to these mentioned, among quite rare pulmonary complications are gangrene and acute edema.		

¹ Archiv für klinische Chirurgie, vol. lxviii.

For every hundred abdominal operations there were 3.5 per cent. pneumonias, either lobar, lobular, or hypostatic. This corresponds to the relative frequency in other large German clinics. The frequency of pulmonary complications is, of course, greatest in advanced life, and at all ages where there has been a pre-existing bronchitis, etc.

That postoperative pulmonary complications are not always the result of a general anaesthetic, like ether, is demonstrated by the frequency with which they occur after local anaesthesia.

Pulmonary complications, as stated above, occur most often after laparotomies, but they may occur as a result of almost any operation, such as operations in the mouth, herniotomies, ligation of varicose veins, etc. They are especially frequent after incarcerated or strangulated herniae.

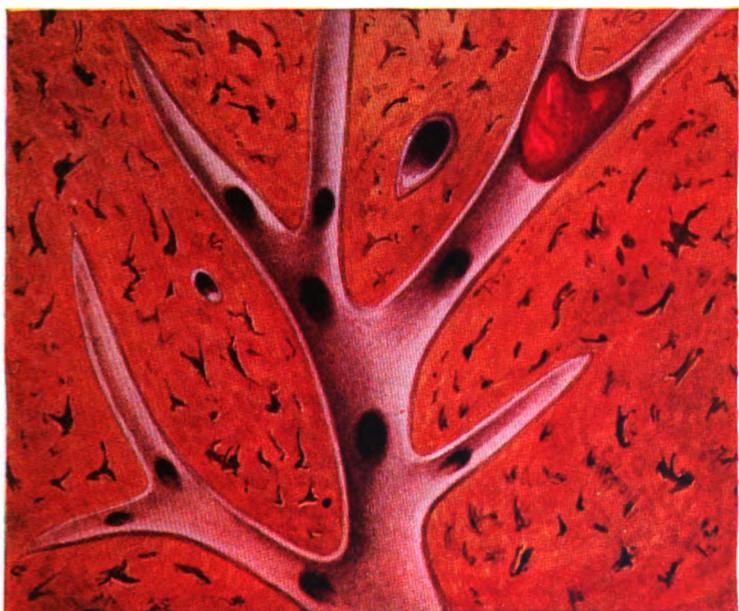
The most common modes of origin are (*a*) by aspiration of mucus or vomitus; (*b*) by the detachment, from the field of operation, of thrombi which are carried to the lungs; (*c*) by migration of organisms through the diaphragm.

The recognition of these various forms of pulmonary complications usually presents no difficulties, since their physical and general signs differ but little from those observed in non-operated cases.

The lobular and hypostatic forms of pneumonia occur far more frequently than does the lobar or croupous variety. The latter affects the right lower lobe oftener than any other lobe.

Lobular and lobar pneumonia, pulmonary oedema, pleuritis, and bronchitis belong to the complications which occur within the first week after an operation. Pulmonary infarcts, embolism, abscess, gangrene, empyema, and hypostatic pneumonia usually occur at a later period. In a few cases, acute pulmonary oedema has followed the administration of the anaesthetic, usually ether. One of the most distressing of these pulmonary complications is pulmonary embolism. This may occur at such a late period, *e.g.*, when the patient is getting up, that all thought of any complication has been dismissed. A thrombus becomes detached, apparently without cause, from a vein in the vicinity of the field of operation, and is swept through the right heart into the pulmonary artery. It

PLATE I.



Section of lung showing ramifications of pulmonary artery and lodgement of an embolus in one of the points of bifurcation of the vessel.

lodges in one of the primary bifurcations of the latter vessel and gives rise to most serious symptoms, enumerated below.

Some of the emboli may not occlude the vessel, but float to the periphery of the lung and cause subpleural patches of embolic lobular pneumonia or pleurisy. In 40 of 66 cases of pulmonary embolism collected by Lotheissen (quoted by Gebele ²) the origin of the thrombus was in the veins of the leg; the next most frequent seat was the pelvic veins.

The recognition of the more serious form of pulmonary embolism is important. The symptoms usually appear quite suddenly at a time when least expected. There is great dyspnoea, accompanied by cyanosis and shallow, rapid respirations. The pulse becomes rapid and almost imperceptible, and death may ensue within a few minutes. In cases in which recovery occurs from this condition, the above symptoms gradually diminish in severity. The physical signs are practically nil.

The occurrence of phlebitis following abdominal operations is considered later.

Prognosis.—The prognosis of postoperative pneumonia in general is favorable, as there is little tendency for the process to spread, but the outcome depends upon the amount of lung tissue involved.

Treatment.—Much can be done in the way of prophylaxis.

1. No patient should be submitted to operation, even under local anaesthesia, without first making a careful physical examination, and no patient suffering from bronchitis, pharyngitis or even rhinitis should be submitted to operation unless the indication is urgent. The operation should be postponed until this local disease is recovered from.

2. Patients suffering from diseases of the respiratory tract should be operated under local anaesthesia if possible, but if it is necessary to resort to a general anaesthetic, nitrous oxide and oxygen should be the anaesthetic of choice, and chloroform should be preferred to ether.

3. The method of administering the anaesthetic is important. Ether should not be poured, but should be given by the drop method, and the ether can or drop bottle should be held near the mask in order to avoid dropping the anaesthetic from a height so that it will

² Beiträge zur klin. Chir., vol. xliv.

pass through the mask down into the patient's throat. Keeping the patient's head turned to the side will also aid in preventing this.

4. If the patient should vomit or mucus collect in the pharynx, the patient's mouth and pharynx should be carefully swabbed with gauze, to prevent this material from being aspirated.

5. As was mentioned under shock, great care must be taken to avoid chilling the patient, not only during the operation, but also in transferring the patient to his room and during his confinement to bed. He should not be exposed to draughts, and should lie between warm blankets immediately after the operation. The room, however, should be well ventilated and the temperature kept quite constant at about 70°.

6. The position should be changed frequently. At least every three hours he should be turned from one side to the other, and as soon as deemed wise he should be elevated with a back rest. This can often be done immediately after the operation.

7. As soon as union will permit, he should be placed in a wheel chair. In ordinary laparotomies this can be allowed on the seventh to tenth day.

The medical treatment for the various pulmonary complications is the same as for the same conditions independent of operative procedure.

V. RENAL COMPLICATIONS

Both ether and chloroform have an irritant effect upon the normal kidneys. A large number of observers have found that in about 25 per cent. of all cases the administration of either of these anæsthetics is followed by the appearance of albumin and of hyaline and granular casts in the urine. This condition of renal irritation lasts only from one to four days, as a rule, and does not give rise to any postoperative symptoms.

Cases, however, have been reported by Fränkel and others where prolonged (two to three hours) administration of chloroform has been followed in eight to ten days by death. In such cases the chloroform caused marked fatty degeneration of the heart muscle, as well as of the hepatic and renal parenchyma.

It has also been found ³ that during the administration of ether

³ British Medical Journal, Sept. 9, 1905.

to animals the excretion of nitrogenous substances is practically abolished.

The question which is of direct interest in respect to postoperative renal complications is, Do ether and chloroform have any ill effects upon the diseased kidney? There is some difference of opinion in regard to this question. There are some surgeons who believe that it is perfectly safe to give ether to nephritic patients. The majority, however, believe that the administration of nitrous oxide gas or chloroform is not followed by renal complications in those previously suffering from such disease. Ether may, on the other hand, be given to a large percentage of patients suffering from nephritis of the more chronic type and not be followed by signs of renal irritation.

In a certain percentage of cases there is indisputable clinical evidence that various forms of renal complications may occur after operation. This often takes place when least expected. The various clinical forms of such complications are:

1. Mild uræmic symptoms, such as (a) nausea and vomiting (prolonged many days after this common postoperative symptom should have ceased); (b) headache; (c) diminished quantity of urine, containing variable amounts of albumin and casts, and decrease in urea percentage.

2. Grave uræmic symptoms—such as convulsions, restlessness, delirium, and coma. The secretion of urine may be practically abolished or it may contain the various constituents so characteristic of uræmia under non-operative conditions. These may be blood, hyaline, granular, and epithelial casts, renal epithelium, large quantities of albumin, and a very small amount of urea.

Postoperative renal complications usually appear within twenty-four to forty-eight hours after the anaesthesia. They may occur in the following classes of patients: (1) as an acute exacerbation of a latent nephritis, which had not been recognized before operation; (2) as an acute nephritis developing in a patient who had been previously known to have a chronic nephritis; (3) as a reflex anuria of one kidney following operations upon the opposite, especially after nephrotomy for renal calculi.

The diagnosis in all of these classes of cases can only be made (a) by excluding other conditions which might give rise to post-

operative nausea, vomiting, delirium, etc.; (b) by the previous history of the case as to urinary findings; (c) by the examination of the urine both quantitatively and qualitatively.

Treatment of Renal Complications.—Patients suffering from renal disease should not be operated upon unless the indication is absolute. This is especially to be emphasized in diabetics, where there is great danger of inducing coma, and where reparative processes are very greatly below par, *i.e.*, anabolism is impaired. Every patient to be operated should have a careful pre-operative urinalysis to determine the condition of the kidneys, and it should be borne in mind that patients with an old chronic nephritis are very liable to have acute symptoms after operation, if ether or chloroform is given. The former especially is to be avoided in chronic nephritis and nitrous oxide or some local anaesthetic should be if possible used.

Following the operation all urine should be carefully measured and the morning after operation a specimen must be examined. If during the first few hours after the operation no urine is passed, the patient should be urged to try to urinate. If he is unsuccessful after eight hours, hot compresses should be applied to his perineum. If no urine is passed within the next hour or two, a warm soap-suds enema should be given. The expulsion of the enema will usually cause the bladder to empty itself. If this is also unsuccessful the patient should be catheterized at the end of twelve hours. If symptoms of renal insufficiency supervene the usual medical treatment should be instituted. The treatment of anuria is either medical or surgical according to whether it is purely a reflex inhibition or the result of a calculus blocking the opposite ureter.

Catheterization should be repeated every eight to ten hours, or as often as the bladder is filled, but only after the other means have first been conscientiously tried without success. It is needless to remark that before any operative interference is undertaken upon the kidneys, ureteral catheterization with examination of the urine of each kidney separately should be made and the customary function-capacity tests made to determine as far as possible the relative ability of each kidney as a guide to the safety of performing a nephrectomy, should this be contemplated or found necessary.

A STUDY ON THE PATHOLOGY AND SURGICAL TREATMENT OF BILOCULAR STOMACH

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IN the *Medical News* for December 7, 1901, I published a paper entitled "The Pathology and Treatment of Bilocular Stomach, with a Report of Two Cases." Since writing this article it has been my fortune to operate on a third case; and since this subject has been considerably studied since the publication of my paper, I propose at present to consider the question as carefully as possible.

I will first record my third operation for this affection.

A female, twenty-six years of age, was referred to me on May 12, 1905, with the following history from her physician. The family history was negative. At the age of nineteen the patient had complained of much pain in the stomach after meals, sour eructations, but no vomiting. At times the epigastrium was very tender so that the patient could not wear her corsets. This condition of affairs continued until 1903, and in September of this year she was seized with very severe cramps in the stomach after eating and during the intervals. At this time she lost considerable flesh, and vomiting always occurred within half an hour after ingestion of food. By a milk diet and rest in bed she improved somewhat, but as soon as she was put on solid diet the vomiting recurred. The vomitus not only contained the food of the previous meal, but also what she had eaten the day before. She was then put on a very rigid diet and sent to the country, where she remained nine months and returned very much improved.

In the early part of 1905 all the symptoms again returned, and in spite of careful treatment she continued to lose flesh. She was then submitted to a careful examination of the stomach. It was found at this time that the epigastrium was somewhat depressed and there was a slight prominence in the region of the umbilicus.

Active peristalsis of the dilated stomach was observed. When distended, the organ reached two fingers' breadth below the umbilicus on the left. There was great tenderness on pressure. The liver and spleen were normal. The contents of the stomach, after a test meal consisting of a cup of tea and half a biscuit, showed one hour later that the biscuit had been well digested and that the amount of liquid withdrawn measured 725 c.c. and contained a large amount of mucus. No free hydrochloric acid, but considerable lactic acid was obtained. On the next day the stomach was washed out, but before this was done 70 c.c. of fluid was obtained, containing some yeast and sarcinæ. The patient was still vomiting all food taken and her condition was poor. Operation was suggested but she declined, hoping that her condition might improve. However, as it continued she finally accepted her physician's proposal and was referred to me.

The patient when she presented herself was markedly anæmic, haemoglobin 58 per cent. The pulse was small and rather frequent. By palpation the ordinary signs of a greatly dilated stomach were detected. The vomitus still contained many sarcinæ and a considerable amount of lactic acid. No tumor could be detected, but I made a diagnosis of probable pyloric stenosis from gastric ulcer, with resulting dilatation of the stomach.

After careful preparatory treatment, the abdomen was opened on May 24, and operation revealed a bilocular stomach, produced by a hard callous ulcer on the lesser curvature; a few small adhesions were broken down. A longitudinal incision five inches long was made in the long axis of the constriction and the wound sutured transversely. In this incision an ulcer was found and excised. The abdomen was closed without drainage and the patient returned to bed in a fair condition. The duration of the operation was twenty-five minutes.

The patient was fed with nutrient enemata for the first two days. After this champagne and peptonized milk were given by mouth, and by the end of a week the patient was put on chopped raw beef and the diet gradually increased so that on the twentieth day following the operation she was being fed on a regular diet. Other than slight distention, which lasted for about ten days after the operation, the patient complained of no discomfort from her

stomach. The sutures in the wound were removed on the seventh day and the patient was allowed to sit up on the fourteenth day. She left the hospital in excellent condition four weeks after the operation, at which time she had gained seven pounds in weight.

I had occasion to examine the patient seven months later. At this time she was eating everything without any disturbance and stated that she felt better than she had for many years. In September, 1908, the patient wrote me that she was perfectly well in every respect.

The term "bilocular stomach" applies to the majority of cases; but occasionally stomachs are encountered which are divided into three, or even four pouches, a condition of affairs readily accounted for, because multiple gastric ulcers may be present, and as they are probably the most frequent cause of bilocular stomach, they may give rise to several strictures, causing the organ to be triloculated or divided into still more pouches.

Bilocular stomach not long ago was thought to be an extremely rare condition, but at the present it is to be considered of not infrequent occurrence, as is made evident by the literature upon the subject. England has furnished the largest number of cases, this probably being due to the fact that gastric ulcer appears to be more frequent there than elsewhere. Mayo Robson has reported nineteen instances, while Moynihan has published eighteen cases. In Germany quite a number of cases have been observed, so that within the space of three years Von Eiselsberg found seven instances of bilocular stomach out of one hundred cases of operations on the stomach. Out of a total of eighty-two operations on the stomach, Schmitt encountered this condition three times. The percentage of bilocular stomachs is in reality much larger, for the reason that patients having this lesion are not always operated upon, since their symptoms do not justify surgical interference. A bilocular stomach need not of necessity give rise to serious symptoms, and when these are present they are frequently treated medicinally. Then, again, there are instances recorded where the lesion was found at autopsy, although the patient had presented no indications of its presence during life. Such an example has been recorded by Heinlein, who at the autopsy of a female seventy-three years of age found a bilocular stomach, while Siewers met with an instance

in a girl twenty-six years of age who had died with the symptoms of perforative peritonitis. At the autopsy a perforated ulcer was found in the lesser curvature with a bilocular stomach, the communication between the two pouches just allowing the finger to pass through. There were no symptoms of the condition during life. I am certain that if operation were resorted to, in many of the cases that we see or hear about in which the patient has suffered for years from gastric disturbances, a bilocular stomach would be found and the patient cured. In support of this I would mention Brown's case of a female forty-two years of age who had presented evidences of a gastric lesion for many years and finally died; at autopsy a typical bilocular stomach was found, the stenosis being so tight that the finger could barely be passed through, while a perforated ulcer was found at the constricted portion.

In discussing the etiology of this lesion two main types—the congenital and the acquired—must be considered. Certain writers do not accept the congenital type, especially Brown, Robson, and Moynihan. In their opinion there are no specimens which positively demonstrate a congenital origin. I would, however, point out that Hirsch and Terret have collected twenty-two cases of congenital bilocular stomach, while Brook, Gilford, Saundby, Sievers, and Hocheneegg have each published a case, so that we have twenty-seven undoubted instances of the congenital variety on record. There is probably an evidence of atavism in these congenital cases, because these sacculated stomachs are to be found in the mouse and some other animals.

The acquired form of bilocular stomach is undoubtedly far more common, and is produced by the ingestion of corrosive substances, perigastric adhesions, gastric ulcer, and neoplasms. Corrosive substances are very rarely the cause. Usually in such cases adults have taken them for the purpose of suicide, while in children the substance is given by carelessness. Schnitzler has recorded a case of a bilocular stomach caused by hydrochloric acid, and Hermann has reported an instance where it was caused by concentrated sulphuric acid.

Perigastric adhesions may occasionally be the cause, and Schmitt has observed one case where a bilocular stomach resulted from a plastic operation for pyloric stenosis done ten months previously.

Bilocular stomach has been produced by carcinoma, the latter developing in an old gastric ulcer. I have been able to collect eight instances where this condition existed. In one case it was accompanied by a pyloric stenosis.

The most frequent cause of bilocular stomach is unquestionably gastric ulcer, which, after pursuing its acute stage, undergoes a cicatricial tissue transformation, but often recurs at the same spot or in its immediate vicinity, thus giving rise to a circular constriction, which not infrequently extends around the entire organ. Ulcers situated on the lesser curvature, because of their horseshoe shape, are more apt to give rise to this change, because they surround the stomach above and result in a more or less pronounced bilocular constriction, particularly when the cicatricial-tissue change is marked.

Spastic bilocular stomach has been reported by Budinger, who found what he terms a "spastic tumor of the pyloric sphincter" and situated near this a small cicatrix. At this point the stomach was almost completely closed, so that a marked bilocular condition had developed; the cardiac portion was very large, while the pyloric portion was the size of a child's head.

Lordosis of the spine has been considered a cause by Hochelegg in one of his cases. The stomach was pressed between the spine and abdominal muscles by the massive development of the vertebrae combined with a marked anterior projection, and was compromised to such an extent that a transverse zone arose in the stomach in which the circulation was hindered. Thus, he believes, a cicatricial contraction developed, resulting in bilocular stomach.

The clinical picture of this condition may be outlined as follows. The patient has usually suffered for a considerable length of time from gastric ulcer, often for ten or fifteen years or even more. Then gradually symptoms of pyloric stenosis appear, and are made particularly noticeable by a sensation of intra-abdominal tension and severe pain in the epigastrium, often radiating to the back and described by the patient as of great intensity. The pain may be present at night as well as in the day, and may reach such a pitch that it is unbearable. After each meal severe eructations and gastric spasm occur. When the lesion is well advanced, vomiting is always present, occurs every time that solid food has been taken, and may, like the pain, last for one or two hours.

The vomitus is always profuse and is greater in amount than the quantity of food and liquid ingested. It contains undigested food, which occasionally will be returned almost unaltered. This undigested food forms the first part of the vomitus, and later food taken the day before may be expelled. This is a diagnostic point of great value. Free hydrochloric acid is occasionally present and usually there are many organic acids, particularly lactic acid. Since fermentation is usually present, sarcinæ and yeast are commonly found. Blood is practically never found in the vomitus, because the process, which in the first place was an inflammatory one, has subsided and there exists only scar tissue. The stools are rarely discolored, but there is usually an obstinate constipation which is with difficulty relieved. Very frequently the patients complain of very severe thirst.

The symptoms of bilocular stomach continue with varying severity for several years, occasionally being interrupted by periods of improvement, until at length they become so severe that the patients lose strength and flesh and are unable to work. At the beginning, the objective symptoms are not particularly characteristic, though when the ulcer is still present, a tumor which is sensitive to pressure may sometimes be felt in the umbilical region. When the bilocular condition has been present for some time, dilatation of the stomach results behind the constriction, which may occasionally be recognized if distention of the stomach is resorted to. The organ may extend below the umbilicus. Of great importance in the differential diagnosis is the cicatricial thickening in the neighborhood of the ulcer, together with spasmoid contractions of the hypertrophied gastric muscle. This may be mistaken for a malignant tumor.

In order to make a positive diagnosis a number of methods have been resorted to and advised. (1) If fluid is introduced with a stomach-tube, it disappears very rapidly; (2) when the stomach is thoroughly washed out a certain amount of undigested contents which have undergone decomposition are suddenly expelled; (3) if liquid is introduced into the stomach or if the latter is distended with gas, an enlargement of the cardiac portion will be found in the left epigastrium, which gradually diminishes and is followed by a dilatation of the pyloric portion in the right epigastrium;

(4) during this period a gurgling sound can be heard in the middle of the stomach by auscultation; (5) after evacuation of the contents contained in the cardiac portion by means of a stomach-tube, an enlargement still remains in the pyloric portion where splashing sounds may be detected; (6) when the stomach is dilated with carbonic acid the borders of the organ become greatly distended while a smaller section of the stomach, becoming narrower, can be percussed, and at this spot gives distinctly the auscultatory signs already mentioned; (7) when distended with carbonic acid, a distinct constriction between the two pouches can be felt. (8) By auscultating the pyloric pouch while pressure is made on the cardiac portion, a gurgling, produced by the passage of gas through the constriction, is heard. This phenomenon can also be made to occur in the opposite direction, but over the stenosis the sounds are not audible. (9) If, after filling the stomach with water, it is illuminated, the pyloric section will remain dark. (10) If the stomach bladder, mentioned by Turck and Hemmeter, is introduced into the stomach and dilated with air, the bladder, which in a normal stomach comes into direct contact with the gastric walls, becomes fixed in the cardiac portion when there is a bilocular stomach, and can be distinctly felt in the left side but cannot be pushed over to the right. (11) When one hand is placed upon the site of the stricture and pressure is made upon the cardiac portion, which has been previously filled with liquid, the fluid can be distinctly felt gurgling into the pyloric pouch.

Decker points out that the following symptoms should be looked for: tension pains in the gastric region, similar to those felt when the stomach has been overdistended with carbonic acid; occurrence of pain about half an hour or more after eating and continuing after vomiting, and absence of pain when only small amounts of liquid nourishment are taken. The vomiting differs from that of gastric ulcer in that it occurs frequently and in small amounts and not in a stream. If the stomach is washed out nothing at first comes back but clear fluid, but finally the remains of food come away. In order to demonstrate this phenomenon the patient must be kept in an upright position for some time before the examination, while during the washing the body must be bent to the left side. When the stenosis is very narrow the vomiting, which previously has been

very regular, may cease; but when it returns the patient is extremely distressed and can only be relieved by frequent washings.

In spite of all these methods of examination at our disposal the diagnosis of bilocular stomach is still a very difficult matter, and in most instances only a probable diagnosis can be arrived at. Out of eight cases of bilocular stomach, Von Eiselsberg only suspected the condition twice and an absolute diagnosis before the abdomen was opened could not be made. Moynihan on the other hand, made the diagnosis with certainty seven times out of a total of eighteen cases of bilocular stomach. I find that in the cases recorded by various surgeons the diagnosis was made with certainty in thirteen and suspected in three. These figures show that the diagnosis was only made before operation in sixteen instances out of one hundred and thirty-one cases. It would be unjust to eliminate a diagnosis of bilocular stomach because of the absence of definite diagnostic signs; for there are a great many cases in which, in spite of the most careful examination, a diagnosis cannot be made before the marked bilocular condition of the stomach is found at operation. The symptoms, however, are those pointing to some chronic affection of the stomach and indicate the necessity for exploratory incision.

If the symptoms are principally those of a gastric ulcer, whether acute or chronic, medicinal treatment is prompt; but nevertheless operation is frequently indicated in the acute type on account of profuse haematemesis, and in this case gastro-enterostomy is the better method of dealing with the condition, because it puts an end to the hemorrhage and allows the ulcer to heal. If the ulcer is not adherent to the pancreas or other viscera it may be excised. Pyloroplasty I believe contraindicated.

Moynihan has reported a hundred cases of gastro-enterostomy for simple ulcer of the stomach and duodenum. Two patients died. Eighty-five were operated on for chronic ulcer with dyspepsia and dilatation of the stomach, with no deaths; while fifteen cases were surgically treated on account of profuse or repeated hemorrhages, with one death. In chronic gastric ulcer, Carless advises pyloroplasty, stating that it is a simple operation, with a mortality of only about ten per cent. He has resorted to it in two cases with good results. This operation can only be done when there are no adhesions and no thickenings or indurations of the pylorus.

If a patient has suffered for years from gastric ulcer, and symptoms of stenosis with dilatation and gastric insufficiency appear, the patient's condition will then become poor and no loss of time should be allowed in resorting to exploratory incision. It seems to me a great pity that certain stomach specialists persist for months in washing out the stomachs of their chronic dyspeptics, thus losing valuable time when the case is fit only for surgical treatment. One case that came under my care some years ago, that of a carcinoma of the pylorus which was so far developed that it formed a visible tumor in the right epigastrium, had had his stomach washed out persistently for six months by a man reputed to be an expert in stomach diseases and who had not detected the condition of affairs.

When a positive diagnosis of bilocular stomach has been made surgical treatment is naturally the only one which will give a permanent cure, and I will now consider, as thoroughly as space will permit, the various methods which have been used to relieve the condition. I would say that Loretta's method is now, with good reason, very rarely resorted to, since its permanent results are very uncertain. Becco believes that it is indicated when the lesion has some mechanical origin, as it removes the causes of compression, provided that the constricted portion is free from adhesions and that there is no evidence of cicatricial tissue on the surface of the organ.

Gastroplasty has been frequently performed according to the method of pyloroplasty. After the abdomen has been opened in the median line, the stomach is incised over the stenosis in the direction of its longitudinal axis and then this incision is sewed vertically, so that the stomach is given its normal shape. I believe that this operation is proper when there is considerable stenosis and when the cardiac pouch is not too greatly dilated. It is also of use when there is neither ulceration nor extensive adhesions. It must be resorted to, moreover, in those cases where, on account of the development of many tough adhesions, it is impossible to perform gastro-enterostomy or gastro-anastomosis. If the general condition of the patient is bad, the operation for the stomach lesion must be as rapid as possible, so that here again it has its indications. One disadvantage of the plastic operation is that it is done in scar tissue, which is poorly nourished; but if an ulcer is found in the scar it can be excised, as I did in the case reported.

There is a certain danger of relapse after gastroplasty; and when there is a very large cardiac pouch with a deep fundus the greater part of the food taken will remain therein and is, with difficulty, propelled through the enlarged lumen of the stenosis. There have, however, been many successful results. For instance, Watson-Cheyne operated on a woman forty-six years of age who presented symptoms of pyloric stenosis, and on account of the evident symptoms a diagnosis of bilocular stomach was made before operation. Gastroplasty was done successfully. A girl twenty-two years of age presented symptoms of stenosis and gastric ulcer. At the operation, Gilford found a bilocular stomach, its cardiac portion communicating by a small opening at the lesser curvature with a subphrenic pouch. The patient was discharged cured sixteen days later, but died a month afterwards from profuse gastric hemorrhage. Autopsy showed three ulcers in the cardiac sac, but the cause of the bleeding was due to an unhealed spot in the incision made for the plastic operation. This case was considered as one of congenital bilocular stomach, because no scar tissue could be found at the point of constriction. Morse permanently cured a male sixty years of age by means of gastroplasty. The patient had suffered for twenty years with gastric pain.

Von Eiseisberg has performed this operation several times, once in the case of a female forty-nine years of age who had suffered for years with gastric disturbance and in whom a large tumor could be palpated in the region of the fundus. The bilocular condition was produced by a broad open ulcer in the fundus of the stomach, which was adherent to the abdominal wall. Nine months later the patient again complained of pain after eating, so that there is a possibility that a relapse occurred. In another case the patient, who was thirty-four years of age, died in collapse ten hours after a gastroplasty had been done. In this case the marked stenosis was caused by an acute gastric ulcer which gave rise to perforation at the spot where the stenosis existed. The third patient was a female thirty-three years of age who for nine months following a gastroplasty was perfectly well, but the gastric symptoms returned, although they improved at first after lavage. This improvement did not continue, so that three years later an exploratory incision was again resorted to and a constriction was found at

the site of the former operation. Gastro-enterostomy was done. In another case, that of a woman thirty years of age in which a probable diagnosis of bilocular stomach was made, Von Eiselsberg performed gastroplasty, but four months later was obliged to repeat the operation on account of a recurrence of the constriction. Nine months after the second operation symptoms again appeared, so that a third operation was necessary, which revealed a stenosis so small that only a finger could be introduced. Gastro-anastomosis was done, after which there was improvement, though two months later symptoms again occurred. These could be kept in control by diet.

The gastroplastic operation which I reported in 1901 performed on a woman forty-seven years of age has been successful, inasmuch as the patient lived for six years without any of her old gastric symptoms, at the end of which time she died from some acute pulmonary process. Valas has been likewise successful with this operation. In another instance recorded by Von Eiselsberg, that of a female thirty-two years of age who was operated upon for a suspected pyloric stenosis, a typical bilocular stomach was found caused by adhesions with the liver. In this case an incision 13 cm. long was made, followed by transverse suture, and, according to the author's own words, the result was splendid.

Schmitt did a gastroplastic operation on a female twenty-eight years of age, the stenosis being so small that only a finger could be introduced. Suturing was difficult on account of the hardness of the tissues. Ten months later a second operation had to be performed on account of a recurrence of the symptoms, and a tough adhesion extending from the pylorus to the liver and anterior abdominal wall was found to explain the pyloric obstruction. The former stenosis would allow four fingers to pass through it. The adhesion was due to a severe perigastritis following the first operation. An ulcer had developed at the pylorus, where cicatricial tissue had formed and given rise also to pyloric stenosis. Posterior gastro-enterostomy was done, which resulted in a cure.

Stich has recorded a case of gastroplasty in a female thirty-one years of age. Five years later the patient was still perfectly well. He also had a successful result in a woman sixty-nine years of age. Mayo Robson has recorded recoveries after gastroplastic

operations in eleven patients. Brook operated on a patient fifty years of age by gastroplasty. The patient had suffered from early youth with gastric pain after eating, and the case was considered as a congenital bilocular stomach. The patient died from collapse.

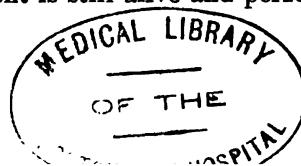
If an ulcer is found during a gastroplasty it can be excised when it is not too large and not adherent to the surrounding structures. This was done by Monard on a patient thirty-three years of age. An incision 7 cm. in length was made at the point of constriction and an ulcer the size of a pea was found and excised, resulting in cure. Likewise, Budinger performed a gastroplastic operation on a woman thirty-eight years of age, who on the day before had had a severe hemorrhage. A bilocular stomach was found and after incision an ulcer was discovered and excised. The patient died a few hours later.

In 1895, Wölfle performed gastro-anastomosis for the first time on a patient thirty-six years of age. She had suffered from gastric symptoms for fourteen years, and at the operation a marked bilocular condition of the stomach was found. Since the two pouches were about equal in size, they were anastomosed and the constriction was left untouched. Gastro-anastomosis may be indicated when the cardiac pouch is much smaller than the pyloric, in other words, when the stenosis is near the cardia. When both pouches are equal in size and can be approximated without too much tension, particularly near the greater curvature, this operation is applicable. It may also be done when the cicatricial bridge between the two pouches is not too wide and when signs of an ulcer in the vicinity of the stenosis or elsewhere in the stomach are absent. Under these circumstances this operation is satisfactory because it allows a large opening to be made between the two pouches. Löwenstein had a successful result in a female forty-three years of age; but in a case recorded by Schwarz, that of a female thirty years of age, the pain returned, so that seventeen days after the first operation he again opened the abdomen and found a large number of adhesions, which he broke up. After this operation the patient improved. Roux and Hochenegg have reported cases of gastro-anastomosis with successful results. Von Eiselsberg, operating on a female twenty-eight years of age who had haematemesis with symptoms of pyloric stenosis, found bilocular stomach and performed gastro-anastomosis. Unfortunately, the incision extended to the

pyloric portion in the neighborhood of the ulcer, which afterwards perforated, so that two days later peritonitis resulted and the patient died. Autopsy showed that the constriction was produced by a circular ulcer which was firmly adherent to the pancreas, the latter being eroded. Gastro-enterostomy would have been the better operation, because in the gastro-anastomosis the sutures were placed in a diseased stomach wall. Watson had a successful gastro-anastomosis for bilocular stomach. Both pouches were very movable and anastomosis was made between the greater and lesser curvatures. Mitchell has operated on five cases of bilocular stomach by gastro-anastomosis, with four recoveries and one death.

Gastro-enterostomy for bilocular stomach is also an excellent operation and oftentimes the only one that can be performed. Thus in bilocular stomach four methods have been resorted to, namely, *anterior gastro-enterostomy*; *posterior retrocolic gastro-enterostomy*; *anterior retrocolic gastro-enterostomy*, and *posterior antecolic gastro-enterostomy*. Gastro-enterostomy is indicated when the anterior portion of the stomach is not much smaller than the posterior, or is as large, or even larger; and when adhesions are not too tough or extensive. When the adhesions are tough or extensive technical difficulties are at once presented.

Martin and Pollard performed gastro-enterostomy by Von Hacker's method on a girl twenty-five years of age. All food was vomited after operation and she died on the fifth day. At autopsy both a stenosis of the pylorus and a bilocular stomach were found, the latter having been entirely overlooked at operation. Budinger had a successful result in a patient forty-two years of age, doing a retrocolic gastro-enterostomy combined with gastropexy. Lindner, in one case, was not sure of the condition of affairs and therefore did a gastro-enterostomy. The patient died a few days later and at autopsy a typical bilocular stomach was found, the lower portion of which only was visible at the time of operation. Childe did a laparotomy on a female fifty-one years of age, having made a diagnosis of malignant disease of the stomach. Gastro-enterostomy was done by Von Hacker's method; the patient died five days later, and at autopsy a bilocular stomach was found. In my paper already alluded to, I reported a posterior gastro-enterostomy by Doyen's method for a bilocular stomach in a female forty-nine years of age. This patient is still alive and perfectly well.



Frada has operated on three cases of bilocular stomach, using Roux's technic of *gastro-enterostomy*, although he employed Murphy's button. In a case of so-called *spastic bilocular stomach*, Budinger performed retrocolic *gastro-enterostomy* with a successful result. Schmitt has done retrocolic posterior *gastro-enterostomy* for bilocular stomach three times. The first case was a male, thirty-two years of age, in whom the correct diagnosis was made before operation. When the abdomen was opened carcinoma was found developing on the base of an old ulcer. The second case was a girl twenty-seven years of age, on whom he operated with a successful result. In the third case the patient, a girl twenty-eight years of age, had had a *gastroplastic* operation done ten months previously; posterior retrocolic *gastro-enterostomy* resulted in a cure of the symptoms, which had continued after the first operation.

Stich obtained a favorable result in a female thirty-nine years of age, and Blake in a woman forty-five years of age, by doing Von Hacker's *gastro-enterostomy*; while Mitchell was successful in a case where he did *gastrojejunostomy*. Klein has recorded a case followed by complete cure, the technic being lateral *gastroduodenostomy*. In this case the bilocular condition had been produced by swallowing a corrosive fluid. The anastomosis was between the cardiac portion of the stomach and the descending portion of the duodenum.

In order to avoid the so-called *circulus vitiosus* after the various methods of anastomosis, an anastomosis may be made in the jejunum, the so-called *entero-anastomosis*, according to Braun and Jaboulay. Personally, with the modern technic of posterior *gastro-enterostomy* this operation is superfluous, I believe, but I refer to it because Maragliano has recorded a case of bilocular stomach in which he supplemented an anterior *gastro-enterostomy* by *entero-anastomosis*, this being followed by an excellent result.

Resection of the constricted portion of a bilocular stomach has been less frequently resorted to than the above-mentioned operations. It can be undertaken in cases where there are no adhesions and where the patient is in a relatively good physical condition. It is absolutely essential that no firm adhesions connect the stomach with the liver or pancreas, because under such conditions there would be great danger in performing circular suture of the stomach. An excellent result was obtained by Krause in a case of bilocular

stomach resulting from chronic ulcer, by means of a resection of the diseased portion, while in another case, that of a female forty-one years of age, in which the stomach, at its point of constriction, would not allow the finger to pass, the diseased portion was excised and the stomach united by two layers of sutures. A successful resection in a case of bilocular stomach has also been recorded by Lichtenauer. Hermann's case is quite interesting. The cause of the bilocular condition was concentrated sulphuric acid which the patient had swallowed four years previously. By palpation a movable tumor was felt to the right of the umbilicus. The abdomen was opened and a stomach greatly diminished in size was found, the greatest point of constriction being near the pylorus. After incision of the organ two areas of stenosis were found, each admitting only the finger. Gastroplasty was done and, in order to relieve the pyloric stenosis, a longitudinal incision was made on the posterior wall and a piece of the cicatricial mucous membrane was excised. On the anterior wall gastrostomy was done in the gastroplastic incision. Pain recurred in four months and the abdomen was again opened. On account of a considerable diminution in the size of the stomach circular resection to the extent of 6 cm. was performed, and the stomach was sutured to the duodenum. This resulted in a complete cure. Kammerer reports the case of a male forty-one years of age who had symptoms of ulcer and pyloric stenosis. At operation bilocular stomach was found and resection of the diseased portion was done, after which a plastic operation on the anterior and posterior walls was accomplished in such a manner that the stomach was given its normal shape.

A combination of these various methods may occasionally be advisable. Thus Zeidler cured a female thirty-three years of age by first excising the constriction caused by an ulcer, then suturing the edges of the incision, and finally performing a gastro-anastomosis between the two pouches.

Not infrequently a pyloric stenosis exists at the same time as a bilocular constriction of the stomach, and when this occurs various procedures may be indicated. For instance, Schloffer performed a gastroplastic operation and then did an anterior gastro-enterostomy for the pyloric stenosis. In another case Braun did an enterostomosis with good results. In these cases both pouches must be anastomosed directly or indirectly with the gut, because after

gastro-enterostomy in the cardiac pouch the result will be *nil* if there is a stenosis of the pylorus at the same time. If the pyloric stenosis is not dealt with, perforation, ulceration, or serious subjective symptoms will follow.

In cases of bilocular stomach combined with pyloric stenosis the following operative combinations are possible: the performance of two gastro-enterostomies, or the simultaneous formation of gastro-anastomosis or gastroplasty with gastro-enterostomy at the cardiac pouch; the combination of gastro-anastomosis or gastroplasty with gastro-enterostomy; and lastly, a gastroplastic operation may be substituted for gastro-enterostomy.

Budinger operated on a female forty-nine years of age who had a bilocular stomach and pyloric stenosis. In this case he resected the pyloric portion, closed the cardiac portion and duodenum, and then did a retrocolic gastro-enterostomy. Durante successfully operated on two such cases, in one of which he did a gastro- and pyloroplasty and in the second case combined the latter operation with gastro-enterostomy according to Wölfler's technic. Under the same circumstances Lumniczer performed the following operations on a woman thirty-two years of age. Partial resection of the stomach was done, followed by retrocolic gastro-enterostomy and pyloroplasty. The result was a perfect cure.

One case recorded by Moynihan is interesting. The patient was twenty-seven years of age, with a trilocular stomach. The middle pouch was the largest, the pyloric the smallest. A gastro-anastomosis was made between the cardiac pouch and the middle one, followed by a gastro-enterostomy between the middle pouch and the upper portion of the jejunum, with excellent results. Moynihan considers the combined method necessary in order to obtain a complete cure. He prefers the combination of gastroplasty with gastro-enterostomy. In the case of pyloric stenosis and bilocular stomach, Von Hacker recommends the combination of gastro-anastomosis with gastro-enterostomy; while Robson advises combining gastroplasty with gastro-enterostomy of the second pouch. The latter surgeon has dealt with such a case by gastroplasty and pyloroplasty, while in another instance he performed a gastroplasty and anterior gastro-enterostomy. Both these patients died, while six recovered when posterior gastro-enterostomy had been done.

In the surgical treatment of bilocular stomach the methods

employed are, as is seen, numerous. To use any one to the exclusion of all others would be injudicious, because very frequently bilocular stomach presents a complicated condition of affairs, so that each case is a law unto itself. It is evident that, of the various operations, one or another would be preferred by the operator, according to his particular experience in a given operation. It would seem, however, that at the present time gastroplasty is most universally resorted to, although many operators do not commend it. I have recorded a number of instances where recurrence took place after this was done, but in my opinion the recurrence was due to the fact that the incision in these cases was not long enough. Out of five gastroplasties, Von Eiselsberg has observed a recurrence in two, while in another recurrence took place after two operations. He consequently does not favor this operation and advocates gastro-anastomosis when it can be performed, that is to say, when the pyloric and cardiac pouches can be approximated without tension. In all other cases he advises gastro-enterostomy between the cardiac pouch and jejunum, particularly because this operation can be undertaken when there are adhesions. Schmitt is also unfavorable to gastroplasty.

Roux's technic of gastro-enterostomy is considered the safest by Catellani, who believes that gastroplasty is only admissible when the upper pouch is of small dimensions. Frada believes that gastro-enterostomy is the best method in all cases, while Elder prefers gastroplasty to gastro-enterostomy. Becco considers gastroplasty and gastro-anastomosis indicated in simple cases; while gastro-enterostomy he believes is indicated when there are stenoses at the pylorus or duodenum, likewise in cases where gastroplasty cannot be undertaken on account of the large amount of cicatricial tissue at the constricted portion, or when gastro-anastomosis cannot be performed on account of pathologic thickening and adhesions in extensive congenital constriction. Hermann recommends in these cases gastro-enterostomy according to Rutkowski-Witzel's technic. He believes that gastro-enterostomy is generally indicated, while gastroplasty he limits to a few selected cases. Circular resection should only be performed when the other methods are inapplicable, or when it does not seem advisable to leave the diseased portion of the stomach behind.

Robson is an advocate of posterior gastro-enterostomy in cases

where the constriction is not very narrow, while *gastro-anastomosis* is to be recommended when the two pouches are of equal size and the stenosis a wide one. If there is also a stenosis of the pylorus a posterior *gastro-enterostomy* may be done at the same time. If the bilocular stomach is due to malignant disease, either resection of the stomach or *gastro-enterostomy* should be resorted to. In nineteen cases of bilocular stomach operated on by Robson there was stenosis of the pylorus present in eight. Seventeen of these cases recovered and two died, making a mortality of 10.52 per cent. In four cases of bilocular stomach produced by carcinoma that came to operation, he had one death, a mortality of 25 per cent. Moynihan, out of a total of sixteen cases of non-malignant bilocular stomach, lost three, a mortality of 18.75 per cent; while in two cases where the condition was due to a malignant growth, he lost one.

Out of a total of thirty-three *gastroplasties* for bilocular stomach, including my two cases, I find three instances of recurrence of the symptoms, two where recurrence was suspected. There was an operative mortality of 9.5 per cent. Out of fourteen *gastro-anastomoses* I find twelve cures and two deaths, a mortality of 14.28 per cent. Out of seventeen *gastro-enterostomies* there were fourteen recoveries and three deaths, a mortality of 17.64 per cent. Consequently, it would appear that *gastroplasty* has the lowest mortality, while on the other hand there have been more instances of recurrence following it; but, as I have already pointed out, this I believe to be due to the fact that the incisions were too short. It seems to me that if an incision of from 14 to 16 cm. be made a recurrence cannot take place, as is proven by my two cases. Should a recurrence take place, however, *gastroplasty* should not be rejected, because it is certainly one of the simplest operations in surgery. Then again, for this very reason it is rapidly performed, and, since many of these patients are in a very poor condition of vitality and cannot withstand a complicated interference requiring more or less time, even at the hands of an experienced operator, this is an operation worthy of important consideration.

Some operators advise the use of the Murphy button in *gastro-enterostomy*, by which device they claim that the operation can be performed quite as quickly as *gastroplasty*; but on this point I cannot acquiesce. Then again, I feel that all mechanical devices

should be avoided as much as possible. Certainly, a gastro-enterostomy performed with clamps and suture should not take more than four or five minutes longer than when a button is used, and if the case can be operated on at all, five or six minutes more or less can have no very great influence on the mortality. If, when one starts out to do a gastroplasty, it becomes evident as the operation proceeds that an unsatisfactory result will be obtained, the interference may be completed by a gastro-enterostomy, preferably posterior. It is hardly necessary for me to point out that all adhesions present should be carefully resected between ligatures before the abdomen is closed, as their presence is alone sufficient to give rise to serious gastric symptoms later on.

As to the prognosis in bilocular stomach after operation, it entirely depends upon the time at which the interference has taken place. If this is resorted to early in the process, when the patient is not reduced in strength and consequently is capable of resisting the operation, it naturally follows that a successful result will be more easily obtained. In quite a few cases it will be seen that had the patients been operated on at an earlier date they might have been cured. I would point out that in every case operated on for symptoms of pyloric stenosis the stomach should be carefully palpated and examined to ascertain whether a bilocular condition may not be present, because this condition has been overlooked on several occasions.

In closing I wish once more to refer to gastroplasty, to say that it should not be done in cases where a gastric ulcer in full activity is present, for under these circumstances the mortality is high and the only proper treatment in these cases is posterior gastro-enterostomy. The reason for the high mortality in cases where gastroplasty has been done in the presence of an acute gastric ulcer is the giving way of the sutures or the perforation of the ulcer.

To sum up I would say that gastroplasty with an incision of not less than 14 cm. is the operation of choice when it can be easily accomplished; that posterior gastro-enterostomy should be resorted to when a plastic operation is not feasible. And lastly, in those rather infrequent cases of trilocular stomach or bilocular stomach combined with pyloric stenosis, one will be obliged to resort to a combination of the methods most applicable to the given case.

EARLY AND COMPLETE RESECTION OF VARICOSE VEINS OF THE LEG

BY P. ALGLARE, M.D.

Surgeon to the Paris Hospitals

By the expression "complete" resection I wish to describe an operation whose purpose is the entire removal of one or both saphenous veins of the lower limb, together with the greatest possible extent of their diseased tributary vessels; this is, in fact, a very free application of the operation of which Rémy, Quénau, Reclus, Lucas-Championnière, and Schwartz have been the promoters in France.

In a paper published three years ago I gave the results of my researches on the question of varicose veins carried on during the preceding years, together with twenty-one personal total resections performed for the purpose of curing that condition or its complications.

Since that period I have been able to collect thirty-five new cases, and also to follow up my former patients. The first operation dates back to January, 1902; in this way I have been able to convince myself of the very satisfactory results given by total resection of varicose veins performed in suitable cases.

Let me mention first the principal arguments that can be brought forward on behalf of the operative treatment of varicose veins, before giving those that seem to favor the process known as early resection. Among the causes that produce and facilitate the steady progression of superficial varicose veins of the variety known as "essential" or "spontaneous," there are two, of a mechanical nature, which play an important part, and which, if a lasting cure is to be effected, the surgeon must aim at modifying as well as the lesions which they help to create.

The first of these is represented by the reflux of the blood from above downward that occurs in the internal saphena as soon as its valves cease to be adequate; the other consists in the flow of blood from the deeper portions of the limb towards the super-

licial veins. In order to study their action I proposed that the former should be called the superficial reflux, in opposition to that which under the same conditions might appear in the deeper veins; and the other, the pressure of blood from the centre.

Of these two causes the superficial reflux is nowadays well known, and it is its pathogenic action which from a therapeutic point of view has particularly occupied the attention of experimenters during the last twenty years. Mentioned by Home, Rima, Regnoli and Rauzi, and Vermeuil, this superficial reflux has been specially studied and demonstrated by Trendelenburg, in Germany, and by Schwartz and Delbet, in France; the latter authors have shown both the importance of valvular inadequacy of the internal saphena, and the major interest that there is in preventing the blood reflux that results from it, in order to improve the condition of these patients.

It was for the purpose of counteracting the superficial reflux that the operation of ligation of the internal saphena, recommended of old by our predecessors, and which, thanks to antisepsis, can now be performed without danger, was brought forward anew. In this connection may be mentioned the publications of Lucas-Championnière, Schwartz, Corné, Rémy, Quénau, and Reclus on simple ligature, multiple ligature, and resection of segments of the internal saphena. It was for the same purpose that without creating any obstacle to the return flow in the saphenous system, Delbet, after experimental research as to the saphenous reflux and anatomical research concerning the valves of the deep femoral vein, has of late performed a saphenofemoral anastomosis at the middle of the femoral vein, that is to say, below a point where it presents two or three pairs of good valves.

The second of the two chief mechanical causes, the flow of the blood from the centre of the limb, acts through the perforating or communicating veins; these are called direct or indirect according to whether they pass directly from a deep to a superficial vessel, or go from one to the other by way of the muscular vessels.

Now as far back as 1824 Briquet, in explaining the appearance of varicose veins, gave as their chief cause the excessive passage of the blood from the centre of the limb to the superficial veins when muscular contraction takes place.

In 1855 Vermeuil advanced the opinion that varicose veins of the leg begin in the deep veins and spread to the superficial ones through the anastomotic vessels leading from one to the other, and also through the veins of the muscles. This writer believed that varicose veins never begin in the main internal saphena, but in its secondary and anastomotic branches.

Delore, in 1894, at the French Congress of Surgery, spoke of the muscular "thrust" brought to bear on the superficial veins from the deeper ones at the moment of muscular contraction, and opposed it to the abdominal "thrust" coming from the iliac reflux into the saphena during movements of the body.

I myself, after having looked for the reasons explaining certain unsatisfactory results or recurrences after ligature operations, or even after extensive resections on the main internal saphena, have called attention to the influence apparently exerted by the flow of the blood from the central part of the limb on the formation of varicose veins and recurrence of accidents after these operations, and to the necessity of endeavoring to prevent this, as much as possible, in the operative treatment of the disorder.

This flow from the centre may be looked on as a force acting at the periphery of the saphenous systems, and one in which there are two separate factors. The first, much the more important, is represented by the return pressure of the blood of muscular nutrition, reaching the superficial veins through the indirect perforating vessels; and the other, by the flow into the superficial vessels, through the direct perforating channels, of a portion of the blood of the central veins.

When the limb moves and the muscles contract, these two pressures may be subjected to a sudden increase reacting on the walls of the perforating vessels and extending even to those of the superficial veins into which they flow. These too-often-repeated pressure-shocks cannot fail in time to modify the structure of these vessels, particularly if the latter show natural defective wall-resistance, and if there are situated on their course obstacles to the flow of blood, such as the aponeurotic rings through which the vessels pass before reaching the central veins, or certain strictures, such as those I have sometimes found, either in the branches or in the main vessel of the saphena.

However this may be, the important point to remember is the existence of lesions at the periphery of the saphenous systems. For anatomical dissections, clinical experience, operations, and histological research show the paramount importance of the flow of blood from the centre of the limb through the communicating vessels to the surface.

On dissecting the net of saphenous vessels injected in a fresh body, or removed at operation, it is seen that it is at the points of emergence of the perforating vessels, or at the points where they open into the superficial veins, that the subcutaneous varicose dilatations are formed and that the largest and most fragile varicose ampullæ are found. In some cases, even, it is seen that it is only at the point where the main internal or external saphena is reached by the perforating vein, or by the varicose distention arising from a perforating vein, that the saphena becomes varicose itself; whereas below the opening of the vessel it has retained its normal size. This occurrence is frequently observed in practice, where we find that if the thigh, for instance, is the seat of a localized varicose condition arising from one or several perforating veins, it is at the point where the diseased vessels open into the saphena that the latter suddenly increases in size, whereas farther down it retains its normal calibre. In many instances we also find, proceeding from below upwards, that the communication of each varicose vessel dependent on a lateral vein is a cause of increased dilatation in the main saphena.

We likewise observe in certain patients, after a forced march or prolonged fatigue, the appearance of varicose ampullæ at the muscular interstices; these may already be large and painful before they give rise to appreciable dilatation in the superficial veins with which they connect. These same ampullæ are particularly noticeable, and indeed indicative of peripheral mechanical force, in patients in whom superficial varicose veins have formed rapidly after deep phlebitis, and where, on account of obliteration of the deeper veins, the greater part of the blood is driven with energy into the saphenæ when walking is first renewed.

Another point to be noted is that in many cases it is at the expense of distended perforating veins that varicose bunches and localized or isolated varicose vessels are formed. When there exists

at a given point on a limb, in the territory of the internal or external saphena, a varicose vessel or a group of such vessels, the rule is that they are produced by one or several large communicating veins, whose point of emergence may be localized by ampullæ visible beneath the skin.

At operation it is also possible to understand the importance of this blood flow from the centre through certain perforating vessels, by the quantity of blood that may gush from them when they have not been properly ligated before section. This abundant hemorrhage from certain perforating vessels may sometimes take place spontaneously at their ampullæ, if they are provided with such; and it may be followed by the serious results with which every one is familiar. In a case on which I operated the day after a serious hemorrhage I found before my eyes, on the ampulla of a communicating vessel of the inner aspect of the calf of the leg, the lesion that had given rise to the escape of blood.

It is evident that the ampullæ of communicating vessels are not the seat of *all* varicose hemorrhage, but they must be looked upon as particularly dangerous, in this respect, on account of their fragility, and every effort should be made to remove them at operation as completely as possible.

Another proof of the great centrifugal pressure occurring through dilated perforating veins is the frequent and more or less rapid reforming of return vessels above and below a main saphena which has been ligated at one or several points, or resected to a certain extent with therapeutic intent. This detail has been mentioned by a number of writers and deserves attention. I myself have noted it several times in patients and have also met with it in the course of dissection.

These anatomo-clinical details are furthermore confirmed by histological research; Ritterer and I have examined systematically the variations in structure of the veins in patients operated on for varicose dilatations, and among the specimens the following one was particularly instructive.

A man aged 49 showed on the right leg near the kneecap a large varicose vein that he had first noticed in 1890 and that had caused him so much pain that he had been obliged to give up his place as letter-carrier, since it necessitated so much walking. I operated

on him, December 15, 1906, performing a total resection of his internal saphenous system; he recovered without incident and when seen again two years later his leg was in perfect condition without varicose veins. At that time he was employed in distributing newspapers.

Macroscopic examination of the specimen showed every stage of phlebectasis. The internal saphena above its juncture with the varicose vein was dilated, but its calibre was practically normal farther down. The varicose vein was greatly dilated and sinuous throughout its entire length and presented a large ampulla near its juncture, at which point there was marked stricture.

On histological examination, at no point of the phlebectasis did we find signs of atrophy of the elements, whether cellular or elastic. The wall of the vein appeared hypertrophied from the outset; hypertrophy, therefore, precedes dilatation. In the case of this big varicose vein, dilatation could not have begun at the saphena itself, because pressure due to saphenous reflux would have first dilated the stricture and then have extended from above downwards. The structure of the vein situated below the stricture could only have been modified and distended by blood-pressure from the deeper veins.

Vessels adjoining varicose veins, which were apparently healthy, had hypertrophied walls; this hypertrophy could only be due to the reaction of the venous wall against deeper pressure.

The valves took part in the hypertrophy and had become rigid and insufficient; the saphenous reflux had consequently combined with pressure from the central veins and still further dilated the vessel.

In these initial stages the connective, cellular, and elastic elements underwent hypertrophy, causing dilatation and lengthening of the vessel. In proportion as the cells became more abundant in the network of connective and elastic tissue, the vessel lost its resistance and elasticity. And since the blood-pressure continued to remain at its normal level the wall dilated more and more and grew thinner. But, we repeat again, even at the final stages of the process we found no atrophied elements; the cells, and especially their nuclei, remained hypertrophied, both in the dilated and flexuous segments and in the ampullæ themselves.

The facts mentioned in this case history show the necessity, in operations upon varicose veins, of endeavoring to modify the superficial reflux, when it exists, and of restricting the deep pressure that has become abnormal on account of distended perforating veins. This can only be accomplished by removing as completely as possible the saphena with all its branches, and the most favorable result will be attained by following up the varicose vessels to the perforating veins from which they arise. In this way the limb can be freed from lesions at the periphery of the saphenous systems, which is always important, for pain and the usual complications of varicose veins continue to occur when the operation has not been complete, including both trunk and roots. In this way, so far as is feasible, an important mechanical influence is also done away with: namely, pressure from the deep veins, a factor which is always capable of giving rise to new distentions in the vein-segments left behind. Of this the following case is a good instance.

A man aged 48, operated on by me in March, 1905, for a varicose condition preventing work and having caused three serious hemorrhages, came back to see me in December, 1908, for another complaint. He said that he had been able to work all the four years since the operation, and that, only four months after he left the hospital, to test his leg he had walked from Paris to Melun, 25 miles, at a single stretch. His limb appeared to be in excellent condition, but I discovered a varicose vessel, which, starting from the interstices of the antero-external muscle group of the leg, continued toward the calf, where there was an ampulla, beyond which a sinuous vein extended upwards toward the thigh.

The man did not complain of this, but there was no doubt that the ascending dilatation had been produced by the pressure of the blood that continued to flow between the two communicating vessels that opened into the former varicose segment, and particularly the one emerging from the muscles of the calf, which must have been left behind at the former operation.

On December 24, 1908, I removed this varicose segment completely and was able to satisfy myself that at the calf of the leg it communicated with a voluminous vessel coming from within. This was the principal cause of the varicosity. When seen again on May 20, 1909, this patient showed no more evidence of dilated vessels.

These varicose vessels, which are found after free operations, are veins that are left behind or that have become distended through the action of important perforating vessels forgotten at the operation; recurrence is therefore due to insufficient operating. For these reasons it is indispensable, with advanced lesions affecting both saphena, to remove them entirely; this double resection has no undesirable effect on the return circulation of the limb.

With localized varicose bunches total resection is also to be preferred to partial removal. The histological researches mentioned above showed that even when the lesions appeared clinically to be limited to a given venous territory, there were already changes microscopically appreciable in the vessels that seemed healthy and that were some distance away from those that were visibly modified. Nothing, therefore, but total resection can give a patient the maximum chance of a lasting recovery, or protect him from varicose veins that are in process of formation, and that will ultimately manifest themselves either in the same region or farther away.

Total resection, applicable with the greatest advantage to cases of non-complicated varicose veins, is equally recommended when there is phlebitis or ulcer. I desire to draw attention in the following case to the importance, that always exists, of getting the patients to submit to operation before the era of complication begins.

A carpenter aged 54 entered the hospital in October, 1908, for phlebitis of the entire internal saphena, that had appeared five weeks previous in varicose vessels which he had had for the twenty years previous; they first appeared in about 1888 and caused him much suffering two years later, while in 1891 an ulcer formed behind the internal malleolus. From this time on he had constant trouble, was prevented from working for months every year, and tried all the usual treatments: stockings, bandages, and ointments. Nothing but protracted rest produced any improvement, or caused the ulcer to heal up for the time being; but ulcer and pain reappeared as soon as he undertook any really hard work. Finally, in September, 1908, the phlebitis occurred which I have mentioned, and I operated on him on November 9, about eight weeks after its onset.

After this lapse of time there is no longer any risk of setting

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free an embolus, and the patient can be removed to the operating room and anæsthetized without fear. If anyone desired to operate at an earlier stage, a week or two after the onset of phlebitis, the operation might be performed under local anæsthesia with stovaine in the patient's bed, and, through a short incision, the main saphena ligated at its juncture with the femoral vein. This slight operation would permit the patient to be removed to the operating room and subjected to operative procedures with entire safety.

The operation performd on this patient was the one described above: entire removal of the saphena, with all its collaterals, which were followed to the utmost possible limit. Stitches were taken out on the tenth day and the superficial threads on the fourteenth; the patient got up on the twenty-first, and left the hospital on the twenty-fourth day completely cured of both phlebitis and ulcer.

The future of a limb that has undergone such an operation as this is generally as follows. On February 9, three months after removal of all these veins, the patient had resumed his work as a carpenter and was able to stand at his bench from eight to ten hours per diem. In another case—that of a porter at the central markets, on whom I had operated three years before under conditions similar to those of the carpenter—the man, who follows a very fatiguing profession, has at the present time a limb in perfect condition, and has worked without intermission since the operation.

The case of the carpenter shows that a man who has suffered for twenty years from a very pronounced varicose condition can be radically and rapidly cured by total resection; but it is to be regretted that twenty years of suffering, great loss of time, and the risks of such a dangerous complication as phlebitis of the saphena were not spared to him by an "early" resection—operation in 1890—when the disorder first began to trouble him. Although the ulcer seems now to be thoroughly cured, no one can promise that it will not relapse in the future, or that behind this lesion is not hidden the condition known as the neuritis of former varicose subjects, which predisposes to recurrences even when it is not clinically manifest. This is another reason for regretting that the patient was not operated upon before the appearance of this important complication.

Finally—postponing to a future time the study of indications, and the critical discussion of the operation of total resection of superficial varicose veins, of the connections of these with deeper varicose veins, and of the application of free resection to the treatment of varicose ulcers, where it sometimes gives excellent results but at other times also fails—I wish, in connection with the foregoing case history, which is similar to those of a large number of our hospital patients, to state the following views as to the most favorable period at which these patients should be brought to operation.

As spontaneous cure of superficial, essential varicose veins of the leg is very rare, as progressive extension is the rule, and as their complications are practically certain to occur sooner or later and may cause either sudden death, grave hemorrhage or embolus, or even, when there is ulcer and neuritis, permanently cripple a man still young and robust, there is every advantage in checking their evolution at an early stage by extirpating them as extensively as possible. It is well not to allow the patient to pass the period where the disorder begins to cause pain, which is often a warning of the complications that are to come. Total resection at this stage is a safe and easy operation, that gives very satisfactory results both immediately and in the future. It is certainly the best means of prevention of the complications of superficial varicose veins.

Gynæcology and Obstetrics

NOTES OF CASES AT THE SAMARITAN HOSPITAL FOR WOMEN, MONTREAL

BY A. LAPTHORN SMITH, B.A., M.D., M.S.C.S. (England)

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of the Samaritan Hospital for Women; Gynæcologist to the Western
General Hospital and to the Montreal Dispensary; and
Consulting Gynæcologist to the Woman's Hospital

Hemorrhoids.—CASE 1549.—Mrs. Y., twenty-six years of age, two children. This patient suffered very severely, during the last months of pregnancy and during her confinement, from the enormously distended hemorrhoidal veins. In fact, the pains of labor were a small affair when compared with the piles. I was inclined to remove these large bunches of inflamed blood-vessels when she first consulted me about them, as I saw no reason why it could not be done; but she was afraid of its injuring the child and I therefore waited until a month after confinement, using local applications for temporary relief.

During many years I have employed Whitehead's operation, but for the last year I have been using the clamp and cautery, as in this case. She suffered very little from the operation. It is important to keep the bowels liquid by means of compound licorice powder, 2 to 4 teaspoonfuls in a little water every night; and in all cases of operation about the rectum to avoid milk, because it forms large masses of hard curds which severely stretch and even tear the newly repaired tissue.

General Peritonitis due to Gangrene of the Appendix.—CASE 1550.—Mrs. C., to whom I was called by Dr. Johnson, had been delivered nine days before and when seen she was apparently suffering from general peritonitis, with a temperature of 103° and a pulse of 140, or, as the family believed, puerperal fever. Ten years ago three or four doctors would have been called in, and they

would all have agreed that it was a case of puerperal fever due to infection of the uterus. Some would have said, "Nothing can be done," while the more aggressive would have curetted the uterus and found it perfectly normal. Now with our very intimate knowledge of the appendix we inquired closely into the previous history to see if she had had any previous and milder attacks of that disease, and found that she had had some very severe illnesses; indeed a year ago she was taken to the hospital in the ambulance and they were about to operate, but when next day she was a little better the operation was not performed. I take it that this was an attack of appendicitis, as were the other severe illnesses, during which she vomited and stayed in bed for several days with her knees drawn up. I could see that the family and friends were most anxious to have me say that it was puerperal fever and that it was due to some fault of omission or commission on the part of her attendant at the birth. But I assured them that the birth had nothing to do with it, and that, on the contrary, the whole trouble would be found in the appendix.

I urged her immediate transfer to the Samaritan Hospital; and a couple of hours later, assisted by Dr. Johnson, I opened the abdomen and found everything matted together with gray lymph. I disturbed the adhesions only just enough to enable me to dig out the appendix, when a gush of thin, foul-smelling pus confirmed my diagnosis. The appendix was gangrenous and perforated. It was quickly removed by Mayo's method, which I will describe later, and the abscess cavity was connected with Douglas's cul-de-sac by forcing a sharp-pointed pair of dressing forceps up through the vagina, after which a large rubber tube with many perforations in it was drawn through the bottom of the incision in the abdomen along the back of the uterus and out through Douglas's cul-de-sac.

The patient was put back in bed in the sitting posture. This may be done unless there is shock, when the patient may be allowed to lie down for an hour; but during all the rest of the convalescence she is kept sitting upright with bed-rests and pillows.

A great quantity of pus flowed from this tube, but her temperature was normal next day and her pulse came down to 80 a few days later. She made a remarkably quick recovery, which I attribute to the Fowler position and the free drainage. The very bad-

smelling pus which caused the intestines to be covered with grayish lymph must have been very poisonous, and if she had been lying down it would have been carried towards the diaphragm and been sucked by it into the lymphatic system, and been carried by the thoracic duct into the veins, soon causing death.

Mayo's Method of Removing Appendix.—Before visiting the Mayos' clinic in April, it had been my custom for many years to cut the appendix off even with the cæcum, thus leaving a clean round hole in the bowel such as would be caused by a bullet wound. I then put in two rows of Lembert sutures, the first one taking in the muscle and the second one the peritoneum.

This method, which, so far as I know, I originated, had the advantage that no mucous surfaces were brought in contact, as was the case when the appendix was simply ligatured and cut off. Neither was there any stump of the diseased organ left, which was always a menace. I had known of many cases in other hospitals where the stump sloughed off, leaving a fecal fistula, because mucous surfaces will never unite. After seeing Dr. Mayo crush the appendix with a crusher so that the mucous membrane was destroyed, the objection to putting a ligature around the stump was removed. He first ties the meso-appendix with catgut, then separates the appendix along its whole length, then crushes it, then puts a ligature of catgut around it, then puts the forceps on a quarter of an inch above the ligature and cuts it off. He then puts a purse-string suture around the cæcum a quarter of an inch from the appendix, pokes the stump in with a special little instrument much like a punch with a needle point on it; then ties the ligature and cuts it off. Then he puts another purse-string suture a quarter of an inch outside of that again, pokes the cæcum in a second time, and buries it. He then ties his third suture but does not cut the ends of the latter off until he has put them around the stump of the meso-appendix and the first ligature. He thus uses four ligatures, the first two being of catgut and the second two of linen thread.

This brand of linen thread deserves special mention, for I have used hardly anything else for the last nine months and am so much pleased with it that I would like to recommend it to other abdominal surgeons. I believe the Mayos first learned about it in Edinburgh. I obtain my supply from a surgical instrument dealer

next door to Dr. Mayo's office in Minnesota, a dollar's worth lasting me about six months. It has cut down the cost of ligatures at the Samaritan Hospital to about one-tenth of their former expense, and at the same time reduced the amount of suppuration very considerably. During the six months I have had to remove only one linen stitch with a crochet hook, and as it was black this was a very easy matter. It seems to be much less irritating than chromic catgut, while for durability I presume it stays there, indefinitely, being encysted by the tissues.

CASE 1558.—I was called to see a Mrs. K., aged twenty-nine, mother of one child six days old, by Dr. Ship, a most painstaking and careful family physician, under conditions exactly similar to the previous case of perforated appendix. In spite of all Dr. Ship's antiseptic precautions, including the immediate repair of the perineum, he found his patient with a temperature of 103° and a pulse of 160 on the sixth day. I was surrounded by the family, who were most anxious to persuade me to say that it was puerperal septicæmia due to some fault of his; but, on the contrary, I told them that it had nothing whatever to do with the confinement and that the patient had a clear history of several previous attacks of appendicitis. I urged immediate operation and within an hour or two of my first seeing her she was in the hospital and her appendix was out.

On opening the abdomen the whole cavity appeared to be filled with pus as there were little or no attempts by nature to wall off the offending organ. The appendix was an enormous one, gangrenous and perforated; and nothing but Fowler's position could have saved this woman's life. A three-quarter inch drainage tube was passed from the lower end of the incision in the middle line down through Douglas's cul-de-sac and out through the vagina, and the woman was put back in bed in the erect posture, notwithstanding her very rapid pulse, which was almost uncountable. She was given salt solution enemata at a slow rate during the first two days, by which time her pulse was down to 120 and quite distinct. She had a very stormy convalescence and went out in thirty-five days with a temperature of $99\frac{1}{2}^{\circ}$ and a pulse of 99.

In connection with these two cases I might again express my conviction that there are every year, in Canada, hundreds of such cases, and in the United States thousands, which are diagnosed and

treated as puerperal fever, and die. They might all be saved by a timely recognition of the possibility of their being cases of perforating appendix, and by the prompt removal of the diseased organ. Only those who have been in his position can realize the great mental distress of the family doctor who loses a case from septi-cæmia. The writer hopes that his frequent reports of such cases may diminish and eventually put a stop altogether to the family doctors' misery from this source.

Chronic Appendicitis.—**CASE 1567** was a Mrs. M. H., twenty-one years of age, who had been suffering seven weeks from severe pain over McBurney's point. She gave a history that she had been struck in the abdomen fourteen years ago, and examination showed great tenderness of the right ovary and tube. I followed my usual procedure in such cases, namely, to remove the appendix and the right tube and ovary. Before I adopted this method I frequently had dissatisfied patients because I only removed the appendix or the tube when both were diseased.

CASE 1590.—Mrs. L., thirty-nine years of age, had had a curetting, amputation of the cervix, and ventrofixation by one of my former assistants on account of general malaise, from which she had suffered for several years past and for which he could find no other explanation. Three or four days later she was taken with severe vomiting. Temperature was low, the pulse fast, and this he attributed to obstruction of the bowel. He sent an urgent telephone message to me late at night at my house in the country and I took the first train into town. The abdomen was reopened about midnight and we found a chronic appendicitis which had completely obstructed the small intestine two inches from the cæcum. The appendix was dug out of dense adhesions and removed and it was then found that in some previous attack the inflamed lymph which had been thrown out had so narrowed the intestine that its canal was smaller than a lead pencil. When the constricting bands were broken the great accumulation of gas and liquid in the distended ileum rushed into the cæcum and her obstruction was relieved, but, alas, too late. It was this constant fight of the ileum to squeeze its contents through its narrowed channel that was the real cause of her several years' suffering. If my young *confrère* had looked at the appendix first and removed it, his patient would probably have been alive to-day.

CASE 1615 was a Mrs. A., forty-five years of age, who had come to my office complaining of indigestion and constipation. A year ago I would have dismissed her with a prescription and rules for diet, but since my visit to the Mayos I examine the abdomen in every case of chronic dyspepsia and nearly always find marked tenderness over McBurney's point with a history of previous attacks of appendicitis. It was so in this case, and after explaining the matter to her she readily consented to go into the hospital and have her appendix out. It was removed with considerable difficulty, being long, swollen, and constricted by adhesions near the cæcum. These adhesions were the cause of her frequent attacks of colic. She made a rapid recovery and has had no pain since. I cannot too strongly draw the attention of general practitioners to the importance of making a careful examination of McBurney's point in all cases of chronic dyspepsia.

Tubal Pregnancy.—CASE 1554.—I was called by Dr. Christie to curette a woman, twenty-five years of age, two months pregnant, who had taken medicine to bring on a miscarriage. She thought that the miscarriage had been accomplished, but that the placenta had remained. Before curetting the uterus I examined the patient under an anæsthetic and found a large mass in Douglas's cul-de-sac. Rectal examination showed the bowel to be emptied. I diagnosed tubal pregnancy, sent her to the hospital, and operated on her an hour later, finding a quart of clots and free blood and an ovum as big as a walnut which had eaten half way through a knuckle of small intestine. Fallopian tube and intestine were both bleeding freely. A few stitches stopped the bleeding from the intestine and since both tubes were diseased they were removed. The patient made a good recovery.

When I proposed the operation Dr. Christie asked me if I was absolutely certain that it was a tubal pregnancy, and I told him that I was not; he then asked me how sure I was, to which I replied "about 95 per cent." He remarked that it was a very serious matter to expose a woman to an abdominal operation for a condition that might not exist. To this I answered that if we follow the plan of only operating when we were *sure*, there would be no operations, and I would not have been able to report thirty-nine women saved who thirty years ago would nearly all have died.

With Dr. Philander Harris I would say: "The failure always to differentiate tubal pregnancy and salpingitis is of little consequence for the reason that the operation is undertaken in the interest of the patient, and while the abdomen is opened the pathological condition can be removed." I removed both tubes in this case because they were both seriously diseased; but I left one ovary which appeared healthy, and she has menstruated ever since.

CASE 1610.—A Mrs. C., forty-one years of age, mother of nine children, the last one nine years old, was sent in from St. Jovite suffering for a month with very severe pain in the lower abdomen and irregular hemorrhages. The diagnosis was comparatively easy, for the boggy mass could be felt. The abdomen was opened and the diagnosis of tubal pregnancy was confirmed by a finding a quart of clotted blood in the lower abdomen. This was proved to have come from a tear in the left tube, and as the right tube was also adherent and closed it was removed at the same time. She made a good recovery, going home in thirty days.

We often notice that when we have one tubal pregnancy we are likely to have another one before very long, so that I was not surprised when the very next—Case 1611, a Mrs. L.—was sent in by Dr. Virolle, who had already made the diagnosis of ectopic gestation. This woman was in a very serious condition. She had had one child ten years ago after a most severe labor by the aid of forceps, which was followed by a very serious illness. When first seen by Dr. Virolle she was complaining of severe pain in the lower abdomen and irregular menstruation, which had always been very regular before; she was also very anæmic. Dr. Virolle deserves great praise for the prompt manner in which he diagnosed the case and the firm way in which he insisted upon the only remedy, immediate operation. She was sent into the Samaritan Hospital and a few hours later the abdomen was opened and found to contain several quarts of blood. It was a difficult matter to remove the ovaries and tubes from the mass of adhesions, for the ovum, after escaping from the tube, had eaten away a large area of the rectum. I feared that the intestine would be perforated and that a fistula would result; so after covering the raw surface of the bowel with omentum which I sewed to it, I took the precaution to put in a drainage tube into the vagina. In this case I did not sew the other

end of the tube to the abdominal incision, which of course is a complication, but we kept the tube in Douglas's cul-de-sac by means of a cross-piece, perforated in several places; this drained away a large amount of serum, the patient being in the Fowler position. There were no faeces and the tube was removed in about a week. The woman made rapid convalescence, going home in three weeks.

CASE 1662, sent by Dr. Alexander of Lachute, was a woman forty-one years of age, the mother of eight children, the last one being seven years old. She had severe pain in the lower abdomen, irregular hemorrhages, and an ill-defined mass in Douglas's cul-de-sac. The question of tubal pregnancy was discussed and almost dismissed at a consultation with my staff. We thought we would see what would result from a careful dilatation and curetting, during which time we might at the same time make a more thorough examination than we could without an anaesthetic. Our suspicions were confirmed and a little later we opened the abdomen and found a tubal pregnancy with a quantity of black clots walled in by adhesion of intestine and omentum. This was removed without much difficulty and without much damage to the bowel, and she made a good recovery, going home four weeks later. If anything, I erred by being too cautious in this case, and I ran the risk of having a serious hemorrhage occur during the manipulations of curetting. What made me take a little more time to make up my mind was that the patient was in the hospital where I could have opened the abdomen at half an hour's notice, if there had been alarming symptoms of abdominal hemorrhage.

High Temperature Following Miscarriage.—CASE 1562 gave me and her family doctor, Dr. Dunstan Grey, a great deal of anxiety. She was a Mrs. S., thirty-six years of age, who had a miscarriage at four and a half months. She had had three other miscarriages, each one more serious, on account of the accompanying temperature, than the previous one. She had a temperature of 106°. She was curetted, the uterus was washed out, and iodine was applied, after which the uterus was packed. The temperature came down to 102°, but her pulse remained at 116 after ten days. Owing to her doctor's feeling that she would never live through another miscarriage and the uterus being two or three times larger than normal, I decided to remove it with the tubes. In spite of

the operation her temperature kept up to 102.5° for several weeks and she went home in very poor condition after forty-two days in the hospital.

Multilocular Cyst.—CASE 1555, a Miss G., forty years of age, came to my office complaining of irregular menses and swelling of the abdomen. After a careful examination, by which I was able pretty surely to exclude pregnancy, I sent her in to the hospital for removal of a tumor, which I thought might be cystic because a portion of it seemed to be continuous with the uterus. On opening the abdomen I had to place many ligatures on the omentum, which was densely adherent to the tumor; but after the omentum had been detached and some adhesions to the abdominal wall broken I had no difficulty in emptying the cyst with a large trocar and delivering it. I was obliged to make a very long incision, owing to the fact that a large part of the tumor consisted of an immense number of loculae which it would have taken too long to empty. She made a good recovery and went home in four weeks.

Painful Caruncle of the Meatus.—CASE 1563.—Mrs. S., thirty years of age, had been suffering from painful urination for a year due to a large caruncle of the meatus. Dr. Johnson had snipped this off at his office, but such a furious bleeding had ensued that he was unable to stop it, and he sent her into the hospital. He tried to ligature the little artery but it had retracted so that he was unable to find it; and when he called me in I decided to find the internal pubic artery, which was easily done by finding out at what point pressure would stop the bleeding. The ligature was then placed under it and the bleeding stopped. This woman had been passing water twenty or thirty times a day and three to five times at night for many months. I mention her case because the regulation of her diet by leaving out meat, and the administration of large quantities of water with some alkali, would have stopped the cystitis and prevented the formation of the granular tissue which we call a caruncle. A pleasant method of taking the water is to order two quarts of lemonade in twenty-four hours with a pinch of bicarbonate of potash in each tumblerful. This makes an effervescent drink. A great many of these cases have been sent to me during the last thirty years and in only two or three of these have I found it necessary to operate. Most of them came with a request from the family

doctor to burn the caruncle and everted mucous membrane; but this I have never done, believing it better, in the few cases upon which I have operated, to remove the caruncle with the scissors and then to bring the healthy edges of the vaginal and urethral mucous membrane together with fine stitches.

Case of Old Maid's Ovaries; Retroversion and Chronic Appendicitis.—CASE 1568.—Miss R., aged thirty-six, was sent to me by Dr. Smillie. She had travelled five or six hundred miles to consult him on account of severe pain all over the lower abdomen which had prevented her from working for several years. There was great tenderness at McBurney's point and there was retroversion of the uterus. Her doctor urged, rightly I think, that whatever was done it was important that we should make a complete cure of her as she was a farmer's daughter and had to work hard and moreover could not come such a distance again. I therefore opened the abdomen in the middle line, removed the tender, adherent and bound-down appendix, and the two old maid's cirrhotic ovaries, and sewed the uterus to the abdominal wall. She went home in thirty days, being kept a little longer than usual on account of the long journey she had to take.

When old maids or married women who have killed all their children *in utero* insist upon my telling them why they are afflicted with cirrhotic ovaries or fibroid tumors I tell them that it is because Nature is angry with them for not having a large family, which I believe is the truth.

Inguinal Hernia Repaired without Disturbing Pregnancy.—CASE 1570 was a married woman twenty-four years of age, who was four months pregnant and suffered from a severe right inguinal hernia. This was closed with mattress sutures. She was given a little more morphine than usual so as to keep the uterus quiet and she went on to full term, being delivered of a fine healthy child. I mention this case because it is one of a great many on whom I have operated for various reasons, such as removal of the appendix, removal of myomas in the wall of the uterus, removal of ovarian cysts and even of pus tubes, without disturbing the pregnancy. The only thing essential for preventing a miscarriage is to avoid reflex contractions of the uterus by means of morphine.

CASE 1571 was sent to me by Dr. Pickle of Cowansville. Mrs.

B., fifty-five years of age, with only one child thirty-two years ago, was suffering a great deal from her bladder as well as tenderness at McBurney's point, and she had rectocele and procidentia recti. I removed the appendix, sewed the bladder up to the abdominal wall, and did ventrofixation of the uterus. There was immediate relief to the frequency of micturition, and she went home in twenty days. She returned in a few months with the bladder down again. I did Stoltz's operation on the anterior vaginal wall and closed the perineum tightly so as to support the bladder. This is the first time that cystopexy has failed.

Menorrhagia Due to Retroversion.—CASE 1572 was a woman forty years of age, sent by Dr. Hall. She would bleed freely on the slightest exertion; she was found to have a tender, retroverted uterus. The ovaries and tubes were removed and the uterus fastened up.

Vaginismus.—CASE 1576 was a married woman, thirty-eight years of age, for whom married life was unbearable owing to spasm of the vulva. This was due to a small ulcerated urethral caruncle which was removed and the vulva thoroughly stretched, with subsequent cure of her misery.

This reads like a small affair, but every one of these cases is a tragedy with the husband's soul at stake. Family doctors and still more gynaecologists fail to realize how many homes are broken up by dyspareunia unrelieved. I could fill, not a paper, but a whole book, with the plain story of the ruined careers of men who though married had no wives.

CASE 1578, suffering from much the same as previous case, had the vagina dilated, caruncle removed, hemorrhoids taken off, and pelvic condition treated for one month without any relief to the pain on her left side. The abdomen was therefore opened and the left ovary and tube removed. She is now well.

CASE 1580, sent by Dr. Pickle, was a girl of twenty-five whose life was a burden to her owing to dysmenorrhœa. I advised either marriage or removal of the ovaries. She had already had two operations for dilatation of the uterus. Both of my suggestions were declined, and she is still going to different doctors, trying to get relief. I am surprised that marriage is not oftener prescribed by the family doctor as a routine treatment for the diseases of

single women. They must know as well as I that a single life is not a natural one and that every normal woman should have a family around her. I can think of twenty sickly girls who are now in robust health with no other treatment than a happy marriage; and practically all marriages would be happy were it not for drink among the men and higher education among the women!

Vesicovaginal Fistula.—CASE 1594, a Mrs. S., aged twenty-six, was sent to me by Dr. Wattier for a very badly lacerated cervix and vesicovaginal fistula. She had had a long and terrible confinement several years before, which had left the vagina obstructed and filled with scar tissue. After her second confinement, which was instrumental and very difficult, Dr. Wattier found incontinence of urine, which he rightly attributed to a tear in the bladder. On closer examination the urine was seen to be coming not from the anterior vaginal wall but from the cervix. I was glad to have once more an opportunity of demonstrating my method of repairing these fistulæ, which might be called “fistula repairing made easy.” It is done by (1) making an incision in the centre of the anterior vaginal wall; (2) dissecting these two flaps up until the fistula is exposed; (3) separating the bladder from the uterus with scissors, cutting right through the fistulous track; (4) cutting out the fistulous track with scissors and sewing up the resulting hole in the uterus; (5) sewing up the hole in the muscular wall of the bladder, taking care not to let the stitches come through the mucous membrane; (6) putting stitches through the vagina and bladder wall in such a way as to displace the line of sutures in the bladder half an inch to the right or left of the line of incision in the vagina; so that (7) when these final sutures are tightened the closed opening in the bladder will rest against the vaginal wall, forming a valve so that the greater the pressure the tighter it is closed.

An important part of the after-treatment is the placing of a catheter à demeure in the bladder so that for about ten days, during which the woman is to stay in bed, the bladder will be left empty and at rest. When this is removed and she is allowed up she will be found to have perfect retention.

Umbilical Hernia—Mayo's Method.—CASE 1595.—Mrs. N., fifty years of age, an enormously fat woman, came to me with umbilical hernia which had caused her great suffering for many

years past. There was a large piece of omentum partially strangulated, and nature was doing her best to nourish it by numerous adhesions. Previous to my visit to the Mayos' clinic in the spring of 1908 I dreaded these cases of umbilical hernia, but since I learned Dr. Mayo's method I no longer fear them. After freeing the mass of omentum, larger than my fist, which had made a pocket for itself in the fat under the skin, and which I could only return to the abdominal cavity after having cut across the abdominal wall right and left from the half-inch opening through which the omentum had escaped, I put the omentum back into the abdomen. Then I inserted six or seven mattress sutures vertically instead of transversely in such a way that when they were tightened the lower flap of the transverse incision was drawn up one and a half or two inches in front of the upper flap, which was drawn down.

This has two great advantages over the older methods: first, because a valve-like closure is formed which fits tighter the more the pressure is increased; and secondly, because, by raising the patient's knees and head after she is put in bed, we can take the strain off of the operation wound completely for two or three weeks. By this time very firm union has taken place.

Both the preparatory treatment and the after-treatment are very important in these cases. In former years I sometimes lost a patient because the family doctor insisted upon my operating on the very day the patient entered the hospital, so that when I attempted to put back the great mass of extruded omentum and intestine I found it impossible to do so because there was no room in the abdominal cavity to hold them.

I refuse to operate upon these cases now unless I have the patient in the hospital at least a week before the operation. During this time she is given the beef-tea or the black coffee diet combined with frequent small doses of Epsom salts; so that by having the intestine empty and collapsed I make room for the fat omentum which has been outside the abdominal walls for many years. It is also important in the anti-fat treatment to make use of the beef-tea fallacy by which the woman is satisfied with large quantities of beef-tea, which, of course, contains no nourishment but makes her feel as if she were consuming a large amount of food. By these means we can reduce her weight by one-half or three-quarters of a pound a day

and also get her into the habit of eating a great deal less. Her family doctor is likewise urged to watch her for several months after the operation, and do everything in his power to remove the forty or fifty pounds of fat in her abdominal cavity. In any case I have been most gratified with the results of the Mayo operation.

I am sorry now to report Case 1620, a Mrs. B., forty-seven years of age, enormously fat, who was sent by Dr. Harvey for prolapse of the uterus and prolapse of the bladder. I removed the cervix but had such faith in my operation of cystoectomy and ventro-fixation that I did not do any operation on the anterior vaginal wall. A few months later Dr. Harvey had to send her back to me with a return of the prolapse of the bladder, the stitches which held it high up on the abdominal wall having cut through the fatty bladder. I have since done a very thorough Stoltz operation and perineorrhaphy, by which the bladder has been lifted up and the posterior vaginal wall also tightened up to the pubic arch. I am in hopes that this will cure the cystocele, although I have warned her and her family doctor that owing to her enormous fatness she is liable to have a relapse.

THE CONSTITUTIONAL TREATMENT OF CHRONIC PELVIC DISEASES

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A GENERAL survey of this subject of the proper general treatment of female pelvic disease brings us to consider the especial adaptability of each method of treatment in its local and general aspects. It is clear to every experienced practitioner that each case must be studied by itself. As individual temperaments, idiosyncrasies, constitutional conditions, special vulnerabilities, and complications, as well as the amount and the kind of local disease, have ever varying modifications in kind and in degree, so in turn this question is constantly presenting itself.

A local disease which is so often but a local manifestation of a constitutional state especially requires constitutional treatment. Local diseases of purely local origin, as trauma, when of short duration and in good constitutions, need no constitutional treatment. Since, however, most cases which come under observation are suffering, not from a local disease only, but also from a depreciated general health—a faulty nutrition—besides reflex disorders, manifested in a multitude of symptoms,—there is a call for both local and constitutional attention. The reciprocal relations between constitutional conditions and local lesions are intimate, never ceasing, and cannot be disregarded. In fine, in a majority of cases encountered both plans of treatment are essential, a neglect of either being a fruitful source of failure.

As no absolute rule is appropriate to all, a comparison of the relative values of the constitutional and local treatment, in chronic female pelvic diseases, cannot fairly be made. Both are usually needed; each has its place.

Let us then consider for a while the constitutional features of such cases. The first point to be gained in general management is, so far as possible to remove the cause or the causes producing, or aggravating, the local disease. Among these may be enumerated

unnatural and unhealthful modes of life, as close confinement within doors, a want of proper exercise, faulty habits of dress, imperfect and insufficient food, prolonged lactation, and sexual excesses. It is generally easy to remove or modify these evils, provided sufficient interest on the part of the patient is enlisted. Numerous instances, by way of illustration, in the practice of most physicians, can be called to mind.

The general plan of such management consists in the use of such means, hygienic, medicinal, mental, and moral, as tend to remove disturbances of normal function, improve nutrition, and elevate the standard of the general health.

Rest.—With the body in the recumbent or horizontal position, venous distention of the pelvic viscera and structures is lessened, and passive engorgements are diminished. Rest, then, is beneficial in congested conditions of these organs, and its advantages should frequently be made available. When there is a local tenderness, and motions of the body are attended with pain, rest is doubly indicated. The presence of non-menstrual uterine hemorrhage, and even of the menstrual periods, is indication for more or less rest. Prolonged rest in the recumbent posture, on account of the fact that it means close confinement, want of muscular exercise, sluggish circulation, and general enfeebling of the whole body, is, if possible, to be avoided. It is seldom, indeed, called for, except when perimetritic complications exist; and then only when moderate exercise is painful.

As Emmet years since judiciously remarked, there never was a greater fallacy in practice than to place in bed a woman suffering with a chronic uterine disease, under the expectation that she will recover by remaining there. While all the benefits of rest may usually be taken advantage of by directing the patient to lie down for an hour or two each day, all of its disadvantages may be avoided by the observance of some proper exercise at intervals. Prolonged rest, too, adds to the nervous sensitiveness attending most bodily diseases.

We should ever bear in mind that when the upright posture of the body is assumed after long rest (because of the quick distention of the much-weakened vessels through gravitation of the column of blood) a certain degree of actual suffering is noticeable, which diminishes, however, on each succeeding effort.

Exercise.—Exercise promotes cutaneous exhalations, increases peripheral circulation, and equalizes the same, so often disturbed by a local stasis within the pelvic viscera. By it the appetite is improved; the capacity for the digestion of greater quantities of food is increased; the bowels are made more active; the muscles firmer; the body weight is augmented; and sleep is favored. Therefore, as a rule, as much exercise should be taken in the open air, in the cooler months of the year, and within the direct rays of the sun, as the strength and comfort of the patient will permit.

Exercise which creates pain, especially persistent pain, should be discontinued, but that which is followed by fatigue only and which passes away after a few hours' or a night's rest, is to be encouraged.

Of all the different methods of exercise, none is superior to walking, inasmuch as it secures the aforesaid results to the greatest degree. Attention to the manifold duties of domestic life gives an occupation to both the mind and the body of women in many ways most desirable. The general health among women in the middle and lower ranks of life, *ceteris paribus*, is, as a rule, better because of the greater bodily activity among them. Horseback exercise is to be interdicted. Calisthenic exercises may at times become quite valuable. The patient should be imbued with the idea that exercise is essential to health, and that, while it is possible to take but the smallest amount at first, it is to be gradually increased day after day; then, from a sense of duty, between proper periods of repose, it is to be maintained in a free, regular, and systematic manner.

Bathing.—In the diseases under consideration, the action of the cutaneous surfaces is generally defective; the exhalations are often hindered and the peripheral circulation is inactive. A healthy action of the skin should be secured and maintained by appropriate bathing, friction, exercise, and an exposure of the surface of the body to the light and the direct rays of the sun. Persons with weakly constitutions and feeble reactive powers are bettered by warm or tepid baths. The Turkish bath is well adapted to those of torpid skins and cold extremities.

Various mineral springs which possess thermal and medicinal qualities are frequently beneficial. The cold bath (sponge or shower) is tonic and exhilarating and most suitable for the vigorous.

The addition of sea-salt to the water adds materially to the remedial effects. Surf bathing at the sea-side is a most excellent tonic.

Clothing.—The clothing should be light in weight, easy to wear, comfortable, and withal sufficient to protect the body during all seasons. The climate throughout much of our United States is quite trying to many persons of feeble constitution. The extremes of temperature are encountered, and the changes of the same are sudden and great. Underwear of flannel or other woollen material of varying thicknesses, or silk covering the entire chest to the neck, and the abdomen and the arms, is needed during the greater portion of the year in this latitude. The corset, a source of much injury to women, impeding as it does the thoracic movements, weakening the imprisoned muscles, depressing the diaphragm and through it the abdominal and pelvic viscera, ought to be proscribed. To avoid any depression of the pelvic organs, all clothing adjusted around the waist should be suspended in its entire weight (five to ten pounds) from the shoulders. The burden of extra skirts can easily be obviated by thicker underwear.

Air.—The importance of open-air exercise and the exposure of the body to the light and the direct rays of the sun has already been suggested. Byford recommended a plan for invalids who in cold weather are unable to leave their rooms, viz., to dress as for the outdoors and open all the windows and doors for several hours to flood the room with fresh, cool air.

Diet.—The administration of food is one of the most essential parts of the general constitutional treatment—to be successful requiring intelligent and faithful care. A large number of diseases, especially those of a chronic type, proceed from errors in diet. Graily Hewitt not long since communicated some interesting facts showing that a continual insufficiency of food—a chronic starvation varying in degree—almost constantly existed in the chronic diseases of women coming under his observation. The quantitative deficiency had extended over a long period of time, commencing at puberty. He drew attention to the indirect effects of such insufficiency in producing vascular disorders of the pelvic organs, chronic catarrhs, and alterations in structure and position. The truth of these facts must be apparent to every practitioner in his dealing with the lower classes. In America, foods in quantities are more

abundant than elsewhere in the world, and in quality inferior to none; nevertheless a slow, insidious process of starvation, from false notions of diet, has become a factor in the causation of the pelvic diseases of many of our girls and women.

The diet of women suffering with chronic diseases should be plain, simple, easy of digestion, but highly nutritious. A judicious selection of the food-stuffs is a very important matter. It is best, therefore, that the medical attendant name what articles of food are to be eaten, and at what intervals. No inflexible rules can be laid down for all females. Personal likes, idiosyncrasies, and special needs are always to be considered in the solution of this problem.

Animal food ranks very high among the elements of nutrition. Meat, especially beef, of good quality and properly cooked (broiled or roasted), is ordinarily as easy of digestion as are the fluid foods, and for a constant diet is easier. The fat of the body is not increased, but muscular activity is promoted. Meat in some form—beef, lamb, mutton, game, poultry, oysters, and fish—should be taken at least once daily. A too free or frequent use of soups is to be avoided since they are only adjuncts to, but not substitutes for, solid foods. Eggs and milk are rich in nitrogenous matter. The former possess a maximum of nutrition in a minimum of bulk, while the latter contains a considerable quantity of fat as well. Their use, save in exceptional cases where they disagree, is to be encouraged. A most excellent plan of diet in cases of malnutrition embraces the ingestion of a half to a whole pint of fresh, pure milk, with from one to two teaspoonfuls of malted milk, slightly salted, from one to two hours after two of the three meals each day. If the digestion is feeble, the milk may be peptonized.

Foods containing much starch and sugar—the carbohydrates—stand lower in the nutritive rank and lowest in strength-giving qualities. Partaken of too freely, to the exclusion of nitrogenous food, they tend to indigestion, acidity, and flatulency. They have their place in our dietary, and for variety are required. The cereals, vegetables, and fruits belong to this class of foods. Bread, which stands first, possesses nutritive properties of the highest order. It is well to change every few days its variety in grain composition. The best breads are crusty and dry. Wheaten bread should be

prepared from the entire grain. Zwieback is an excellent bread for a change. Vegetables may be taken in moderation, not more than two kinds at a single meal; of fruits one kind at a meal.

The fats—the hydrocarbons—though not the exclusive, are active fat, heat, and strength-producing agents. Butter, cream, the fats of meats, oils, etc., are most valuable elements of alimentation when there is malnutrition or a lack of adipose tissue. Pavy expresses it thus: "Fat accumulated within the vesicles, and susceptible of re-absorption into the blood, forms a store of force-producing material, to be drawn upon as circumstances may require." Cream with coarse oatmeal, an abundance of cold butter upon the bread, and well-cooked meat-fats are selections which may be made with the above object in view.

Coffee should always be taken in moderation, not oftener than once daily. Tea is less stimulating; it too should be taken of moderate strength. We have known serious disturbances of the heart's action to follow its frequent use. Cocoa and chocolate are excellent substitutes for coffee or tea.

The use of alcoholic stimulants demands the most careful regulation. All invalid women are even more prone than the sterner sex to contract habits of excessive alcoholic drinking. The grateful effects quickly expressed, the free relief to the sensations of languor and nervousness, soon pave the way to their frequent and too free use. Very rarely ought alcoholic drinks to be prescribed under the plea of depression and exhaustion. Wine and malt liquor taken in moderation with the more hearty meal and in selected cases become beneficial. To those who labor under a feeble digestion, are anæmic, and of spare habit, and who can be trusted to their use, the aforesaid alcoholic beverages may occasionally be prescribed.

The ingestion of foods at proper and regular intervals is of the next importance. It will not do to wait for an appetite; in the meantime the patient may be starving. Food is the natural stimulant to the stomach and appetite can be created by a judicious ingestion of food. In the foregoing plan of alimentation, the patient should have special instructions, and should be held to them, until habit and taste are created.

Medicinal Means.—In addition to a systematic regulation of the dietary, the employment of certain medicines plays a most im-

portant rôle, in aiding the functions of digestion. So frequently are these functions disordered that it is seldom they do not require some special attention, which should be the first step in general treatment. Appetite is to be promoted, and the various symptomatic disorders of the stomach are to be controlled.

Attention to the Functions of the Alimentary Canal.—There is no more common complication of chronic uterine diseases than is constipation, none more serious, and none which, for the want of proper attention, is more calculated to retard a progress to recovery. Considering the frequency and the extent to which constipation exists in some women, it is no longer a matter of surprise that it is a fertile source of pelvic disease. For not only does constipation impede the venous flow of blood within the rectum, favoring congestion and hemorrhoids, but it is directly influential in obstructing the venous circulation within the uterus and other pelvic viscera and structures. The uterus becomes not only pressed upon or dislocated in position by fecal accumulations within the colon and rectum, but, because of an increased vascularity, it is rendered heavier. Its ligamentous attachments are stretched, relaxed, and weakened. Here are two factors alone conducive to displacements. Indirectly connected with the pelvic circulation is the portal current of the blood, which in turn must be made sluggish. Appetite and digestion are now impaired.

Constipation is a disease, the cure of which can be obtained only by studying individual cases and their causes. A mental attention directed to the bowels, in endeavoring to obtain an alvine evacuation, daily, at regular stated times, is a matter of prime importance. Habit, albeit of slow acquirement, can be established in this regard with perfect regularity, failures largely resulting from a want of due patience and perseverance.

Every effort should be made by the means of diet, drinks, exercise, and regularity of habits to obtain free and regular alvine movements, before resorting to the use of any medication. Medicines, however, are quite generally needed, but it should be borne in mind that they gradually lose their effects, and that the more taken the more will be required. Active purgative remedies should never be resorted to for uncomplicated constipation; nor are any required to bring about a cure. Drugs always stand in a subordinate rank to hygienic measures.

The various laxatives and cathartics act by virtue either of promoting intestinal secretions or of exciting muscular peristalsis. Constipation presents conditions of defective secretion in either the upper or lower intestine, or a paresis of the muscular fibres of the intestinal tube. Defective secretion in the upper intestines is evidenced by clay-colored, pasty, unhealthy-looking stools; in the lower intestines, by hard, dry, scybalous formations. Obstructions to the alvine passages are encountered within the pelvis of women on account of uterine enlargements and displacements, notably retroversions and retroflexions. Thus the various indications for the use of different remedies are obtained.

Defective secretion of the upper intestines call for such remedies as the mercurials, podophyllin, leptandrin, iridin, and ipecac; of the lower intestines, aloes, colocynth, and the salines. Muscular inactivity of the intestines is overcome by *nux vomica*, belladonna, physostigma, aloes, and faradization. Two or more of these indications—defective secretion and muscular torpor—often present themselves. The practice of Emmet and Byford, of commencing the treatment of those who have long suffered as chronic invalids by administering the mild chloride of mercury as a cholagogue and occasionally repeating the same, or the use of mercury in form of a blue pill, followed by a saline, as a cathartic, is doubtless very efficient in stimulating the portal circulation and secretions, dislodging fecal accumulations, and preparing the way for the use of the stomachic tonics. These remedies have also a revulsive effect on the congested pelvic viscera. This plan, although seemingly harsh, is not contraindicated in states of debility and anaemia.

When the tongue is furred, the alvine movements small, hard, dry, or painful, the various mineral waters, or magnesium sulphate, taken in the morning while fasting, are indicated. The following formulæ will be found to meet the indications of many cases:

R Resinæ Podophyllini,
Ext. Belladonnæ,
Ext. Nucia Vomica, ss, gr. ii (0.13 Gm.)
M. Ft. in pil. xii.

Sig.—One pill at bed-time if no movement during the day.

R Aloini, gr. iv (0.25 Gm.)
Strychnina, gr. $\frac{1}{2}$ (0.02 Gm.)
Ext. Belladonnæ, gr. iii (0.20 Gm.)
M. Ft. in pil. xx.

Sig.—One at bed-time if necessary.

So soon as the requisite dose of any laxative for the individual patient has been determined, and the bowels, by its aid, have established regularity of evacuation, the dose should be gradually diminished until none is taken. The colon, and especially the rectum, of women after years of constipation generally becomes dilated, and loses all its contracting and expulsive action. Instead of a channel for the passage of fecal matter it is transformed into a dilated sac for its accumulation. The frequent resort to active cathartics of any kind only increases this difficulty by leaving the parts in a weakened state. Hence active catharsis is injurious. Manipulation of the abdominal walls, by kneading, especial attention being given to the whole trunk of the ascending, transverse, and descending colon, may be resorted to with advantage. Direct faradization of the intestines is useful, the positive electrode being placed over the whole abdomen, while the negative electrode is utilized within the rectum, fifteen to twenty minutes daily.

The frequent and long-continued use of enemata is to be discouraged, for in time they lose their effect. The author has seen excellent results following perineorrhaphy and posterior colorrhaphy, in relieving constipation dependent upon a relaxed vagina and rectum.

General Medication.—The whole range of tonic medication is more or less useful in the treatment of pelvic diseases associated with depreciated conditions of the general health. For practical purposes, all tonic and restorative medicinal measures may be limited to the following: iron, quinine, *nux vomica*, arsenic, phosphorus, cod-liver oil, electricity, and massage. Each of these eight tonics deserves especial mention.

Iron is probably more frequently prescribed for the chronic diseases of women than any other remedy, and no other is capable of doing more good, under certain restrictions, in properly selected cases. The general indications for its use are anaemias, strumatosus and syphilitic diatheses, and some neuroses; the local indications are amenorrhœa, dysmenorrhœa, leucorrhœa, and torpid and flabby states of the pelvic viscera, especially in neurotic and phlegmatic temperaments.

Quinine, the chief alkaloid of cinchona, is the best representative of the whole list of vegetable tonics. In moderate doses (gr. i-ii, *ter die*) it is a stomachic and general restorative tonic.

Nux vomica, besides its usefulness in the atonic and neurotic forms of dyspepsia and in torpid states of the intestines, is to be employed in small doses, for its stimulo-tonic effects. These tonic virtues are increased by combinations with iron, thus:

R. Ferri Sulphatis Exsiccati, \mathcal{D} ii (2.60 Gm.)
Quininæ Sulphatis, \mathcal{D} ii (2.60 Gm.)
Strychninæ Sulphatis, gr. i (0.65 Gm.)
Extracti Gentiane, q. s.
M. Ft. in pil. xii.
Sig.—One pill after meals, as directed.

All preparations of iron should be discontinued during the presence of the menstrual period, to be resumed again, if indicated, following its cessation. In my experience, small doses of iron, long continued, do better than large ones.

Arsenic checks retrograde metamorphosis and improves nutrition. It is a good remedy, in small doses (gtt. i-iii) before meals in irritative dyspepsia, and rather aids than hinders normal intestinal action.

Phosphorus, in the form of the phosphates and phosphites, is a very important element in the nutritive processes. All the preparations of this medicine tend to increase the menstrual flux.

Cod-liver oil, judiciously prescribed, ought not to impair the appetite; it meets favorably many of the morbid constitutional states found in women with chronic female diseases.

We must not fail in this connection to make mention of a few other remedies of more than ordinary efficacy. *Hydrastis*, or golden seal, is a recognized tonic of the stomachic order, is mildly antiperiodic, and acts somewhat like quinine. For a long time hydrastine has been acknowledged to be an excellent remedy for the chronic affections of the mucous membrane of the stomach, the intestines, the kidneys, and the bladder. Unquestionably it influences favorably their capillary circulation. Besides, it has a pronounced ecbolic action, inferior only to ergot. Experience confirms our estimates of its virtues as a haemostatic in the treatment of uterine fibroids. Since it is better borne than ergot, it may be used for a longer time. Thus, also, many cases of chronic endometritis attended with menstrual derangements and leucorrhœa are improved by its long internal administration.

Pulsatilla is an old but now neglected remedy. We desire to

refer to it as a most excellent medicine for not a few cases of dysmenorrhœa, especially those of the neurotic form. Given to such patients in moderate doses, three times a day during the menstrual intervals and every one to three hours during the menstrual periods, according to the severity of the menstrual pain, marked benefits follow in many, and permanent cures of dysmenorrhœa in others. Again, a general nervousness, a fear, a melancholia, or a despondency, occurring in neurotic females at or about the menstrual times, are controlled more or less by its timely employment.

Cimicifuga is also one of the best remedies for dysmenorrhœa of the neuralgic and the congestive varieties. It acts like, but feebler than ergot, in inducing and increasing uterine contractions. Very useful it is for certain cases of amenorrhœa, in which the menstrual flow has been suspended because of some mental shock, emotional disturbances, and physical exhaustion. It is also useful for hysterical symptoms and mental depression.

Fluidextract of *caulophyllum* we have found to be the most prompt and reliable medicinal remedy we possess for delayed appearance of the menstrual period. Just as efficacious is the fluidextract of *hamamelis*, for conditions of menstrual profuseness.

A superior combination, as a uterine tonic, is composed of *helonine*, *caulophyllin*, and *cimicifugine*, which may be taken during the menstrual intervals.

Electricity in the form of faradic and galvanic currents is very often properly utilized. A marked physiological effect of this agent is to promote and increase the menstrual flow, irrespective of its local or general use.

Systemic massage has proven in practice to be one of the best tonics. By this method an excitation of the cutaneous circulation is followed by a general rise of the temperature; the muscles are brought into an active exercise without any expenditure of nerve force, and soon there is an acceleration in all the organic functions and a gradual increase of weight. A most marked improvement in the various morbid phenomena of the nervous system follows. Local tenderness and pain disappear; a pleasant sense of exhaustion, and with it a refreshing sleep, is apparent. Faradization and massage combined form the two most valuable means of artificial muscular exercise; the good effects of exercise are obtained without

active participation. Successful results with massage and electricity require the employment of a *masseuse*.

S. Weir Mitchell of Philadelphia has obtained some surprisingly good results from general massage conjoined with an exclusion of the patient, with an enforced rest, a suitable diet, and electricity. Each one of these has been utilized by others, but to him is due the credit of first scientifically combining these different means into one common system of treatment.

The typical cases most likely to be benefited by massage are those of long standing, who are bedridden, wasted, hysterical, neurasthenic, with a variety of simulated disorders. Such patients have probably lived for years a miserable existence in chronic invalidism. In many, though by no means all, as some might suppose, there is some local trouble within the pelvis, but the resulting general disturbances have at last become so pronounced as completely to overshadow the local mischief. Every endeavor to secure an amelioration by further treatment, probably local, or by general medication, is utterly useless. Playfair has well remarked that the worse the case is, the more easy and certain it is of cure by the Mitchell plan of treatment.

There are, however, not a few cases of neurasthenia, debility, and wasting in women, consequent on some chronic uterine ailment, who while not confined to the bed or to the house may be benefited by massage, or massage with electricity, and a full diet, combined with partial rest and no seclusion. The different features of this plan of treatment should be varied to suit individual cases.

The frequent practice of prescribing opiates—morphine hypodermically in particular—because there is pain, with no investigation or consideration of its cause, is and has been one of the crying evils of medical practice of to-day. Except for acute pain due to inflammatory action or after a surgical operation, opiates or narcotics are seldom called for. They are dangerous remedies for chronic pelvic disease; and their use, once commenced, soon begets a subjective erethism and a neuralgia as difficult to overcome as the original affection. Every discomfort is dwelt upon and magnified; the drug intoxication becomes the only solace. But difficult as it is to resist their imperious cravings, any dependence upon these drugs must be disregarded, or otherwise the case is hopeless.

Almost equally pernicious is the habit of prescribing some opiates—chloral and various hypnotics—to produce sleep. The last named are the least objectionable, but their use should never be depended upon for any length of time. The bromides are vasoconstrictors and depressors of reflex action; hence these prove to be our most reliable remedies for the reflex neuroses, physical and psychical. Sleep, an abundance of which (eight to ten hours daily) is needed, should be obtained by regular habits, proper food, plentiful exercise, massage, electricity, and a cool and well-ventilated bedroom.

Many of these suggestions in general management may seem quite commonplace and unnecessary, but to one who has had much personal contact with such diseases in their manifold forms there is nothing in the least promising in results which should be deemed unworthy of trial. The patient should manifest an intelligent co-operation. Here is at least one of the battles to be gained. The utmost regularity in all habits and faithfulness in the observance of all directions are requisite. Every detail is important; he who gives heed to each is the one who, other things being equal, meets with the most prompt and thorough success. Chronic diseases require chronic treatment. There can be no restoration of the local, so long as the general health is deranged. The reciprocal relations between the two are so strong and intimate that a permanent improvement in the one can only be co-extensive and commensurate with the other.

In no class of diseases is it more incumbent upon the physician to bring to bear the influences of a psychic and a moral treatment. His own manner should be cheerful, hopeful, and inspiring. A personal magnetism consists in no small degree in creating confidence, so necessary to enlist the proper interest and intelligent co-operation of one long sick. To dispose her mind from herself and her condition, to direct her thoughts into new channels, to enable her to exercise the most healthful discipline of self-control, are by no means ever an easy task; but well done they may accomplish more than medication in restoring lost health.

The medical teaching of the twentieth century, without neglecting the conquests of the preceding one, must give a larger and broader field to psychotherapy. The nervous patient is on the right

road for recovery so soon as she has the conviction of a coming cure—a faith abiding in the measures used. It is of the greatest importance to obtain such a victory at the start, for it often decides the fate of the whole campaign of a successful management. Success here as elsewhere very often depends upon the physician's gift of persuasion.

So extended is the sphere of the application of remedial agents in the constitutional management of these diseases under consideration that a thorough knowledge of the whole field of medicine embraced is requisite. To survey the system at large, to recognize the import and the significance of special symptoms, to detect disease in kind and in degree, wherever found, must needs be the office of the rational gynaecologist. No class of affections, the body over, possess so many ramifications, assume so many phases, induce such general disturbances, as do the chronic diseases of the female pelvic viscera. Therefore, no one can be a competent and successful gynaecologist who is not first a thorough physician.

Orthopædics

CONGENITAL JOINT DEFICIENCIES (MULTIPLE) *

BY CHAS. H. MUSCHLITZ, M.D.,

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THE limitation of joint motion has indeed a very large etiological field, but one factor in the causation of ankylosis, rarely mentioned, is its occasional congenital origin. Many of the modern text-books and recent articles fail to speak of it as a congenital anomaly. Bradford and Lovett state that it may occasionally occur as a congenital condition. The volumes of Hoffa, DaCosta, Whitman, Reference Handbook of Medical Sciences, Keen, Bryant, Buck, Thorndyke, and Taylor do not consider it. W. J. Little, in his classic treatise on ankylosis, omits mention of it.

A true congenital ankylosis, either bony or fibrous, partial or complete, is undoubtedly one of the rare congenital affections. Goldflam (*Münch. med. Woch.*, No. 27, 1906) reports in a family of 46 members, in three generations, 36 who were afflicted with congenital absence of the interphalangeal joints between the first and second phalanges of the middle, ring, and little fingers. Lamris (*Münch. med. Woch.*, No. 27, 1906) reports a case of a young and otherwise normal man in whom the middle, ring, and little fingers of both hands were without joints between the first and second phalanges.

The aforementioned cases might well be classed as true, complete, bony, congenital ankylosis. In the case about to be described, ankylosis is partial in the shoulder, elbow, and knee, is bony in the elbow, and presumably fibrous in the shoulder and

* Read before the Northwestern Medical Society, Philadelphia, Pa., March 1, 1909.

knee-joint. There is some doubt as to the exact type of ankylosis, whether false or true, for the reason that the condition of the capsular ligament cannot be ascertained. There is no evidence of tendon contracture or other periarticular disturbance, except at the wrist. X-ray examination has been of much value. The case history examination is as follows:

Patient, I. B., age 16 years, was a full-term, breast-fed infant. Delivery was spontaneous with breech presentation. The mother worked very hard during the pregnancy. At the third month the mother attempted abortion by means of drugs, but without effect. A short time afterwards she had several fits, and was then struck on the abdomen. Immediately after the delivery of I. B. the family physician noticed her inability to flex and extend the legs fully. Double club-hand and double club-foot were also noted. When three days old she had convulsions of the left arm and leg from which she recovered without interruption. Teething began at five months. When four years old she was operated upon for the correction of the club-feet. She suffered attacks of measles, whooping cough, and scarlatina in childhood.

Examination of Upper Extremities.—Both shoulders are unusually small and the muscles much atrophied. Motion in the shoulder-joint amounts to five degrees in all directions. With movement of the scapulae, however, she is able to raise the arm to the level of the shoulder. The anterior and posterior axillary folds are unduly wide. The muscles of the arm and forearm are atrophied from disuse. The forearm can be flexed to a right angle and extended to 35 degrees. (Patient with some difficulty is able to nourish herself.) Both hands are flexed at right angles, and can only be partially corrected. The power of the fingers is fairly good. Webbing of the proximal phalanges on both hands is quite marked.

Examination of Lower Extremities.—Motion in the hip-joint seems normal. There is no evidence of contracture. She can flex both knees to an angle of about 70 degrees, while the extension is normal. There is considerable grating in both knee-joints. The right patella is normal, while the left is very small and scarcely palpable. The ankle-joint motion is normal and the feet tend to eversion. The musculature of the entire leg is very good.

Examination of Back.—The right shoulder is lower than the left. The right hip is higher than the left. The right breast is lower than the left. There is a slight S-curve of the spine with convexity to the left in the dorsal region, and convexity to the right in the lumbar region. Motion in spine is very good.

General.—Patient is about the average mentality and is able, even with the deformed hands, to write very well. The gait is rather peculiar, due to the limitation of motion in the knees. Radiograms by Dr. W. F. Manges show:

Wrist.—Joint-surfaces are somewhat irregular in outline but smooth and free.

Elbows.—The articulating surface of the ulna is unusually deep. The external lateral ligament is thick and shows quite plainly in the skiagraph. The joint-surfaces are free and smooth.

Shoulders.—The scapula is small in comparison to the other bony parts of the shoulder. The glenoid cavities are very small and shallow, the neck being almost absent. The heads of the humeri are small and irregular in outline. The tuberosities of the humeri are extremely large as compared with the heads of the humeri. The epiphyseal lines are prominent and more or less ossified. The clavicles and olecranon processes show no marked abnormalities. The joint-surfaces are free and smooth.

Knees.—These present little that is unusual. The fibulae are very small. The patella ligaments are ill developed and show but poorly. The fibulae are longer than the tibiae, the heads of the fibulae extending to the articulating surface of the tibiae just above the level.

Hips.—These show a high grade of coxa valga. The heads of the femora are large. There is no irregularity in the joint-surfaces.

Spine.—The spinal column seems free from abnormality except in that the intravertebral discs appear to be thin.

The ribs in the upper dorsal region go off from the vertebrae at right angles to the column.

There is no evidence of bony ankylosis in any of the joints examined.

Heart and lung examination by Dr. B. F. Royer: Heart shows a pulmonary stenosis (congenital). Lungs appear normal.

Patient I. B. at 16 years of age, showing right club-hand and left hand in cast almost corrected.



FIG. 1.

I. B. at 10 months, showing club-hands and club-feet with shoulder and elbow deficiency.



FIG. 2.

A case of Dr. H. Augustus Wilson's similar to Fig. 2, with multiple joint deficiencies. Note long anterior axillary folds.

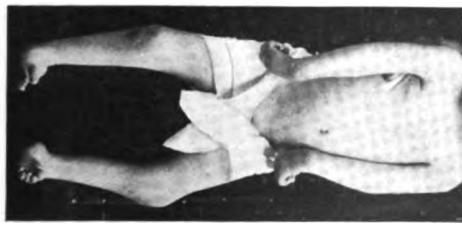


FIG. 3.

I. B. has been under treatment at the Jefferson Orthopaedic Dispensary for the past year, during which time the Jones method for correcting club-hand of the palmar type has been applied. The left hand is in very much better position than it was prior to beginning the treatment. The right hand has not been treated excepting by manipulation.

Through the courtesy of Dr. H. Augustus Wilson, I am able to reproduce a photograph of I. B. (Fig. 2) when about 16 months of age. Fig. 3 is a case which came under Dr. Wilson's observation some years ago and is here reproduced by his permission. The joint involvements are similar to those of I. B., including double club-foot and club-hand.

Pædiatrics

HIRSCHSPRUNG'S DISEASE *

BY PHILIP S. POTTER, A.B., M.D.

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HIRSCHSPRUNG'S DISEASE, or idiopathic dilatation of the colon, was first described by Hirschsprung, a Danish physician, in 1880. It may be represented pathologically by dilatation and lengthening of the colon, with hypertrophy of its walls; and clinically by persistent constipation and distention of the abdomen.

According to the symptomatology, one must distinguish two groups of cases; namely, those which show at birth, or in the first days of life, the phenomena of persistent constipation and gaseous dilatation of the abdomen; and others in which these symptoms begin later, for the most part at the time of weaning, or at the beginning of accessory feeding.¹

The first group is represented by failure of spontaneous evacuation of meconium at birth, followed in a short time by a swollen, tense abdomen, and later by symptoms of a chronic intoxication, and interference with respiration. In the second group are those cases in which, after some months of complete health, persistent constipation sets in, especially about the time of accessory nourishment, followed by gaseous distention and severe cachexia.

While later authors believe this congenital dilatation of the colon is a compensatory dilatation, due to some obstruction, Hirschsprung and Mya consider that it is due to some fault in embryonal development, and that after birth, because of this abnormal development, the dilated intestine has hard work to push along the fecal material, because of its abnormal calibre. Thus little by little the dilatation increases, and at the same time constipation appears.²

* Read before the New England Pediatric Society, Boston, Mass., March 20, 1909.

Treves³ says that the particular term idiopathic dilatation is based upon the assumption that the distention of the bowel is not due to any obstruction in its lumen, but rather to a congenital defect in the terminal part of the bowel, and that there is in these cases an actual mechanical obstruction.

Cheadle⁴ believes this statement is too absolute, but he does admit that most of the extreme cases, those in which life is threatened, and those which are almost invariably fatal, are due to actual mechanical obstruction from congenital stricture of the lower bowel. He also considers that cases presenting an extreme degree of dilatation accompanied by all the symptoms of dangerous embarrassment to the vital organs do, however, occur in children as the result of extreme and persistent constipation alone, aggravated often by injudicious treatment, but without organic stricture.

Jaboulay⁵ and Durante⁶ have shown that the arrest of development may depend on vascular anomalies of the intestine, or vascular lesions depending on infections or intoxications transmitted through the placenta.

In a recent work, Treves,⁷ studying the pathogenic mechanism of Hirschsprung's disease, insists on the rôle of circulatory and nervous troubles as a cause of this affection. He is said to have obtained in a dog a very intense meteorism by ligature of the mesenteric vein.

Concetti⁸ demonstrated, besides the hypertrophy and hyperplasia of the circular muscular layer and muscularis mucosæ, a proliferation of the connective tissue in the neighborhood of the submucosa, together with dilatation of the vessels, an obliterating arteritis, and a leucocytic infiltration. As time goes on ulcerative processes of the mucous membrane of the large intestine take place, and lead to abscesses of the submucosa. He divides megacolon congenitum into three great groups: The first group he designates as microcolia or simple lengthening of the colon, principally of the descending colon. Not finding enough room in the hollow of the abdomen, the colon is obliged to fold on itself, thereby causing a stagnation of the fecal contents with all the direct and indirect symptoms which depend on this abnormality. This form he says is compatible with life, and if the infant is not carried off by an intercurrent colitis it can recover; for as the child grows older,

the anomaly in question disappears and the lengthened portion of the intestine regains its normal dimensions.

In the second group the colon is not only lengthened, but also thickened. There exists a sort of hypertrophic sclerosis with proliferation of the connective tissue which has a tendency to substitute itself for muscular tissue, thereby choking the glands and narrowing the vessels. These modifications would be compatible with life, but more often the sick child succumbs during the early years of its life to an ulcerative colitis.

In the third group are classed those cases in which the colon presents itself in the following state. Its lower portion is dilated, with or without hypertrophy of its walls; the subjacent portion of the intestine is normal or dilated, with or without hypertrophy of its walls. Following the intensity of the malformation, the infant dies a short time after birth or survives at the most a few months.

Fenwick,⁹ on the other hand, considering the hypertrophy as the fundamental fact, concludes that the dilatation is always consecutive to mechanical occlusion somewhere and is a phenomenon only secondary and accessory. He puts Hirschsprung's disease in the three following categories: (1) There is a torsion or bending of the pelvic colon or rectum. (2) There is a congenital narrowing of the large intestine. (3) There is a permanent spasmotic contraction of the lower extremity of the colon and in particular a contracture of the external sphincter of the anus.

Griffith¹⁰ demonstrates the rôle of a simple habitual constipation as a factor of colicky dilatation and hypertrophy. Whatever the cause may be, habitual constipation tends to provoke hypertrophy of the walls, but at the same time an inflammatory process is often set up in the mucosa and submucosa, colitis intervenes, and paralytic dilatation of the intestine of necessity follows.

"Doubtless in all the cases of pretended megacolon, by twisting or idiopathic reasons, it is admitted that the muscular element hypertrophies in order to cause an intestinal evacuation. The result has been justly compared to vesical hypertrophy in the hypertrophy of the prostate, it being a general law that if there is an obstacle to evacuation a muscular organ, in order to overcome it, hypertrophies its contractile elements. The hypertrophy is at first quite sufficient and the fecal evacuations are at first just enough,

although irregular. This goes on until there comes a time when the muscle is forced into an acute asystole. It is the transient irritation of retention, and these irritations can repeat themselves progressively. Finally the end is the absolute insufficiency of the musculature, forced and annihilated by the sclerosis, which sclerosis is the ultimate end of the clinical evolution."

When the histories and dispositions of a certain number of cases of pretended idiopathic megacolon are analyzed critically we find that the factor of chronic constipation plays such an important rôle that we cannot help but assign to it the cause of the dilatation.¹¹ The fecal stasis necessarily causes abnormal fermentation. The resulting gas, not being able to escape by the anus, distends the intestine, and more or less rapidly this dilatation tends to overcome the intestinal contractility in a temporary or definite fashion. The proof of this is shown in a case of chronic constipation which is at first simple, but soon becomes aggravated, and finally takes on all the characteristics of Hirschsprung's disease. The more this aggravation follows a chronic colitis, provoked by the fecal stasis, the more it paralyzes the intestinal musculature and facilitates the distention of the colon. That is to say, the distention may be the result of a chronic congenital or pseudocongenital constipation whose intimate cause has for a time escaped us, but acting always by the mechanism of an obstacle to fecal evacuation.¹²

The question has been asked, "Is the affection properly congenital?" Ammon¹³ is the only one who has shown a dilatation in a fetus of seven months, where the principal dilatation was in the rectum and took the form of an immense vessel; yet his observations were incomplete and without microscopic examination.

"What is the symptom which appears first?" Is it constipation or dilatation?

In fifty cases out of sixty-two collected by Gaujoux,¹⁴ constipation clearly preceded the dilatation. In the cases in which exact *début* of the constipation was not noted, it seems that the two symptoms appeared almost simultaneously. This idea was, moreover, that of Hirschsprung himself when he said: "The first thing which disturbs the physician is that no meconium appears in spite of several purgations. It is only later that we see the abdomen get bigger, distend, and become very hard."

Although the affection may not be demonstrated as absolutely congenital, yet nevertheless it is particularly frequent in a nursing infant or appears more often in the months following birth; so we can consider it as pseudocongenital and due to the influence of one or more causes which commence to exercise themselves during birth or a little after.

"It seems then very legitimate to make two parts to all the published facts of the said idiopathic dilatation of the colon. On one side there are some very rare and yet unexplained facts which give Hirschsprung reason to believe that all the clinical manifestations seem to be due to a defect in the first arrangement, developed in intra-uterine life and after birth under the influence of the same unknown forces which have put it in evolution since the beginning.

"In another group the notion of obstruction to fecal evacuation denotes the pathological sense. The megacolon is not idiopathic; it is acquired and secondary to such and such a cause of incomplete obstruction, that is, chronic constipation."¹⁵

Gaujoux¹⁶ says it is possible to affirm that "the concurrence of symptoms of Hirschsprung's disease exists but responds above all to a clinical reality and follows divers etiological factors."

Theoretically possible, the idiopathic dilatation is an anomaly of very rare occurrence, and there exist very few facts which absolutely demonstrate that the dilatation is idiopathic in origin. It ought, moreover, to concern only nurslings and to manifest itself at birth and pass on rapidly to death. Although a true Hirschsprung's disease really congenital in origin, but of a type nearly theoretical, is rare, we ought to recognize and to know diagnostically the existence of that which we call the concurrence of symptoms of Hirschsprung, characterized by a chronic constipation with dilatation and hypertrophy of the colon. In all cases, moreover, this syndrome or concurrence of symptoms is clearly secondary to a constipation, more often congenital or pseudocongenital. Before deciding that the case is one of idiopathic congenital dilatation, it is necessary to eliminate all those factors which it has been shown may be responsible for the production of dilatation. To do this one must regulate feeding, examine the condition of the sphincter ani, the calibre of the rectum, and bring about, if possible, for a certain time, regular evacuations of the bowels. The report of the

following case will illustrate certain points which have been referred to in the preceding pages.

CASE.—Maud S., of Irish parentage, was born April 18, 1905. The estimated weight at birth was about ten pounds. Family history, as far as it was obtained, is excellent, the people belonging to the type of the best working class. All the other children have always been healthy.

While the mother was pregnant, her sister had some abdominal operation on the intestines, the nature of which could not be ascertained. A second sister used to come home and dilate on the operation until the mother became quite wrought up about it.

The mother had had two miscarriages, one at six weeks and another at five months.

This child was the seventh of ten children. The labor was easy, and the condition of the child immediately after birth was normal. The next day the child had a slight convulsion.

The baby was breast nursed until it was fourteen months old, but the nursing was irregular both in respect to time and amount. Then it was started on oatmeal and breakfast food, yet from the sixth month it had tastes from the table. At two years of age she began to eat meat, and became an excessive meat eater.

Her first teeth appeared at the age of six months; the dentition was accomplished without difficulty, but was accompanied by gastrointestinal symptoms. She could sit alone at the fifth month and creep at the twelfth, talk at the thirteenth, stand at the sixteenth, and walk at the seventeenth.

When she was two years old she had whooping-cough, and at the age of three passed through an attack of measles.

After birth meconium was passed naturally, but from this time on the mother said she was not like the other children in regard to her bowels, as they did not move very well. When she was two years old, she had a diarrhoea, probably of the infectious type, which lasted seven weeks.

When she was sixteen months old her parents first began to notice the distention of her abdomen, and at the same time she began to have anorexia, fever, some abdominal pain, and vomiting, which was expulsive. Water could not be held on her stomach. From this time on she began to lose flesh and strength.

She had always been a nervous child, picking at the bedclothes and putting the fuzz from the blankets into her mouth. Lately she has been in the habit of pulling out her hair and chewing that, and a few days ago she passed some hair by the rectum. After the distention of the abdomen appeared, her bowels always had to be moved by an enema.

When first seen by me, when she was three years old, she had a fair appetite, slept fairly well, but had some hiccup, dyspnea, cough, and vomiting. The vomitus was sour, not digested, and was independent of the taking of food. The mother said the stools obtained by enema came with great force and expulsion of gas, but were dry and looked like ginger sprinkled on the napkin.

On examination, the skin was pale and flabby and hung in folds, and the child looked greatly emaciated. There was no rosary, no enlargement of the epiphyses. Reflexes normal, chest negative.

The abdomen was enormously distended, tense and tympanitic. There was no caput, and no protrusion *per se* of the umbilicus. The superficial veins were well outlined.

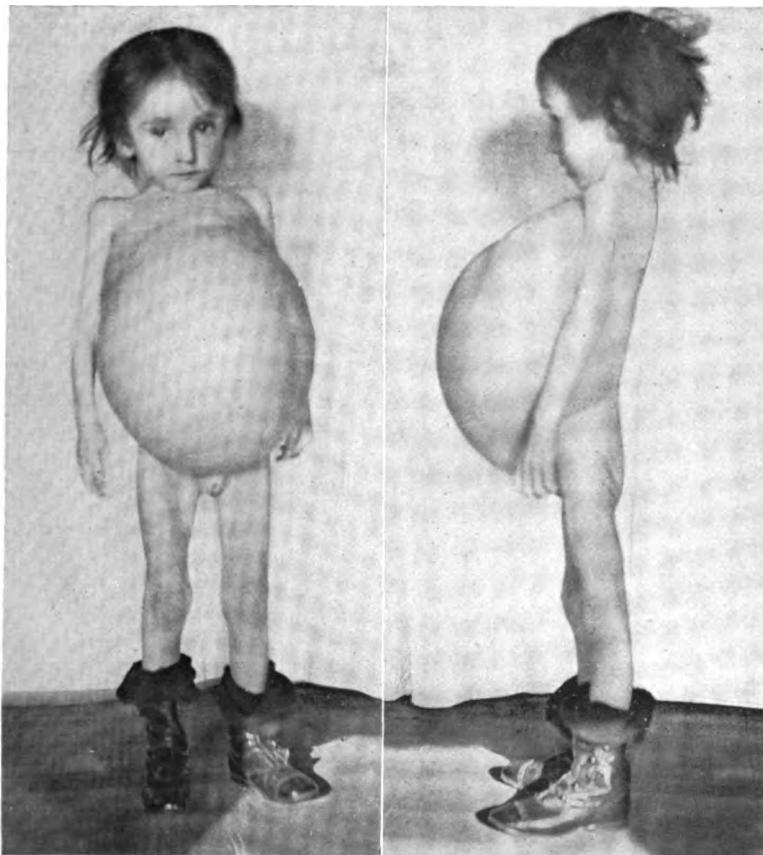
There was a well-marked vermicular action of the intestine, starting in the lower right quadrant and passing upward, then across the abdomen and down the left side. No fluid wave could be obtained, nor was there any shifting dulness. The abdominal contents could not be felt. There was no tenderness on palpation, but there was a slight transitory pain when the vermicular action began. Rectal examination was negative.

Measurements: At the umbilicus, $29\frac{1}{2}$ in.; at the ensiform, 23 in.; at the mammae, 21 in.; greatest convexity, $30\frac{1}{4}$ in. (3 fingers above umbilicus); circumference, $33\frac{1}{2}$ in.

At this time a turpentine enema was given, but later very little of the fluid was passed by the bowel. She was then baudaged and put on the oil treatment of Kerley, together with a laxative diet, and malt and cod-liver oil. The next day the abdomen was much softer and measured as follows: At the umbilicus, $20\frac{1}{2}$ in.; at the ensiform, $22\frac{1}{4}$ in.; at the mammae, 21 in.; greatest convexity, 22 in.

From this time on irrigations were kept up daily, after giving the bowels a chance to act by themselves, and the child increased in flesh and strength, so that within a month the abdomen was nearly normal in contour and remained so, except for slight fluctuations,

FIG. 1.



Hirschsprung's disease (megacolon congenitum) in child of 3 years, showing, besides distention of abdomen extreme emaciation.

until one week before death, when again it became enormously distended. At this time she began to vomit, and two days before death vomited some corn which the mother said she had eaten three weeks before. There also came away in the bowel washings some seeds of an apple she had eaten a week before. She now began to fail rapidly, became very emaciated, and died.

After some little labor permission was obtained to look at the bowel. The stomach was found atrophied, being 3 inches long by 1 inch wide, and showed an hour-glass constriction. The diaphragm was considerably domed up, leaving very little space for the chest contents.

The spleen was 2 inches long and 1 inch wide. There were no ovaries or tubes, and in their place one saw nothing but stubs. The liver was firm, thin, and pushed way over to the right side, so that the left lobe reached only to the median line.

At the junction of the ileum and cæcum there was a stricture 6 inches long. The transverse colon was collapsed, owing to the puncture by the undertaker. It was dilated and its walls somewhat thickened. The extent involved was 15 inches, and it was 4 inches wide in its collapsed state. At the junction of the descending colon and sigmoid was another stricture 4 inches long which looked much like a fibrous cord; the lumen of the stricture was the size of a lead pencil.

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ON CASES OF UNFORESEEN DEATH IN SCARLET FEVER

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It is not absolutely unusual in infectious disorders to see a patient suddenly succumb, whereas his condition a few hours previously seemed quite satisfactory, or in any event gave rise to no uneasiness. These cases of rapid or even sudden death are well known during typhoid fever, where they may occur not only in the convalescent stage, but as early as the first week—without counting the instances in which they are the first manifestation of undetected typhoid fever. They are also seen in inflammatory rheumatism, in pneumonia, diphtheria, influenza, and other acute infectious disorders.

But there is no question but that among the various infectious diseases no one is so treacherous, or exposes the patient to such a degree to unforeseen death, as scarlet fever. Trousseau, in his clinics, says that of all the exanthematic fevers scarlatina is the one in which it is least possible to foresee the danger; that it presents complications, usually unexpected, which the most experienced practitioner cannot foresee even when they are imminent; and that there is no disease that is so disconcerting to the physician, or in which his previsions so often prove erroneous. Duclos speaks in the same tone: "There are few acute disorders that have given rise to so many surprises, or unforeseen painful incidents; death occurs in scarlet fever altogether without premonition or possible explanation."

These cases of unforeseen death occur at all periods of scarlet fever. They have been reported quite at the beginning, before the eruption had appeared, and even before the angina; these are the fulminating cases of malignant scarlet fever. In a condition of perfect health the following symptoms may appear in a patient and run their course more or less completely: incessant vomiting, diar-

rhœa, violent delirium, convulsions, sometimes severe dyspnoea without chest signs, hyperpyrexia (42.4° and 42.8° C. have been reported), a small and extraordinarily rapid pulse, and finally, complete collapse. "The child is unrecognizable, the eyes are dull and sunken in the orbits, the look is fixed, the cheeks pale and slightly cyanotic, and the hands cold. No answer can be obtained from the patient except sighs or a word or two. Little by little he loses consciousness, the heart sounds grow weak, the pulse thready, and death occurs in profound coma." This terrifying drama can run its course in a few hours, twelve, eleven, ten, or even fewer.

For these cases the diagnosis is only possible through knowledge of an existing epidemic, or of cases of the disorder in the patients' surroundings; but when an epidemic *begins* with a disaster of this kind, as happened once to Baginsky, the most experienced physician may find himself non-plussed until other more characteristic cases give him the key to the enigma.

In cases such as these the physician is astounded at the suddenness with which the symptoms appear in a state of perfect health; but as soon as the first pathological manifestations show themselves, their gravity is so evident from the start that mistake is impossible, and there is little likelihood of an error in prognosis.

The case, however, is no longer entirely the same in instances such as those that Wunderlich refers to as "rudimentary cases with malignant evolution." In these the disorder begins in a very mild way; but at a very early stage, "as it were, before the case has had time to develop, there occurs with surprising rapidity, or even suddenly, an accident such as an attack of convulsions, delirium, coma, or suffocation, that suddenly induces death. On examining the patient after death the skin shows no trace of eruption, nor do the internal organs reveal in any way the cause of the catastrophe."

In other cases death occurs suddenly and at the beginning of scarlet fever, but in these the only alarming symptom is a thready and extremely rapid pulse. Henoch has, it is true, laid great stress on the importance of this tachycardia (a pulse reaching or exceeding 170 in a child) as a sign of cardiac paralysis; but nevertheless this is an isolated symptom that has to be looked for, and that does not strike the attention in any way so forcibly as the dramatic symptomatology of an ordinary case of malignant scarlet fever. The following are two cases of this kind reported by Goldschmidt.

CASE I.—"A woman aged thirty, of strong constitution, had an infant sick with scarlet fever. At one of my visits I found the mother in bed complaining only of general distress. There was a slight eruption on the skin, and redness about the tonsils; there was neither dyspncea nor cyanosis, but the pulse was wretched and thready. I had a presentiment that this woman was going to die, and this did in fact occur a few hours later."

CASE II.—"A woman in the prime of life and excellent general health was living in the same house with a niece who was suffering from scarlet fever. When I saw her she had taken to her bed a few hours before and I found the symptoms of the beginning of scarlet fever and a pulse irregular, excessively rapid, thready and without tension. There were no other serious symptoms, but I did not hesitate to announce that a catastrophe was imminent, and the patient succumbed a short time after my visit."

These cases are of the greatest interest; but it is a pity that no information is given as to the nature of the terminal accidents. They mark the transition between classical cases of malignant scarlet fever and the following ones, in which on the fourth or fifth day of an absolutely normal case of scarlet fever without the least signs of gravity, the patient is suddenly stricken with serious symptoms and succumbs in a few hours. Here an error in prognosis is almost unavoidable, and the following is an instance of this class.

CASE III.—A little girl, aged seven, came to the hospital with scarlet fever, the attack having begun the day before with sore throat and headache. On examination, a moderate degree of eruption was found, the tonsils were red and slightly swollen, without exudation, the submaxillary glands were moderately enlarged, and the evening temperature was 39.9° C. The following day the eruption was more marked, no albumin was found in the urine, the general condition was good; temperature 39.3° in A.M., 40.4° P.M. Next day, at the morning visit, the patient was perfectly quiet, temperature 39.9°, there was slight white exudation on the right tonsil. In the afternoon the child became quite restless, and at five P.M. a bath at 38° was given. When taken out of the bath she became pale, inert, and answered questions indistinctly. The intern was called at once and found a temperature of 41.2°, the pulse was weak

and rapid but still quite perceptible, there was no dyspnoea, no adventitious sounds in heart or lungs. Little by little the pallor increased, the child lost consciousness entirely, and death occurred at 7.30, exactly two hours and a quarter from the time that the serious symptoms commenced.

This case is not an isolated one. Duclos, in the article alluded to above, relates several, some personal and others due to different authors:

CASE IV.—A child aged ten ran an absolutely regular course of scarlatina with no symptom causing uneasiness. The morning of the fourth day the child was doing well and the physician told the mother that she could go to church. Called back in less than an hour she found the child unconscious, inert, the muscles completely relaxed. The pulse was thready, extremely rapid, the skin burning; there was no modification of the eruption. Dyspnoea steadily increased, but no signs were audible on auscultation. Death took place in less than two hours (Tonnelé).

CASE V.—A young and vigorous man, on the fourth day of an absolutely regular attack of scarlet fever, developed sudden and unforeseen loss of consciousness, with burning skin, extremely rapid pulse, great dyspnoea, and unaltered eruption. Death occurred in less than four hours after the change (Leclerc).

CASE VI.—A young woman went through an ordinary normal attack of scarlet fever. On the fourth day of the eruption the same sudden and unforeseen loss of consciousness and other symptoms as in the preceding cases appeared. Death supervened in four hours (Miquel).

CASE VII.—A young girl with scarlet fever developed on the third day of the eruption, fifth day of the disease, a sudden and absolutely unexpected loss of consciousness, with intense dyspnoea, extremely rapid pulse, and high fever. Death came on in four hours (Bretonneau, who claims to have seen several other similar cases).

CASE VIII.—A woman aged thirty-five had a regular attack of scarlet fever. When the disease was at its height the physician found the patient at one of his evening visits in excellent condition, laughing with the persons about her. Two hours later he was sent for; the patient was unconscious, muscles entirely relaxed, slight

mydriasis, pupils failed to react to light, general sensation almost abolished. Death occurred in four hours (Duclos).

CASE IX.—Workman, aged twenty-five, with no alcoholic habits, showed on the fifth day of the attack of scarlet fever, fourth day of the eruption, the same symptoms, and the same ending in six or seven hours (Duclos).

CASE X.—A woman, aged twenty-four, in the best of health, at noon on the fourth day of an attack of scarlet fever, felt well enough to ask her physician to have her bed made; but three hours later he was sent for in haste to find himself in the presence of the same symptoms as in the two previous instances, and death occurred in three hours and a half (Duclos).

CASE XI.—A case of a patient who died on the fifth day, fourth day of the eruption, after four hours of a sudden and alarming condition that appeared absolutely without premonition (Charcellay).

Duclos writes that he knows of other instances such as these, that he has heard of from fellow practitioners. Tapret also had occasion to see a similar instance. The following case, quoted from Baginsky, can also be mentioned:

CASE XII.—A young girl, aged eighteen, robust, in excellent health, coming from a house where there was scarlet fever, entered the hospital with a moderate degree of fever and angina, without eruption. On the fifth day, sudden and absolutely unexpected collapse appeared, and death took place in a few hours, with signs of cardiac paralysis and pulmonary oedema.

In 1853, in a communication to the Edinburgh Medical Society, Wood stated that in some instances collapse occurs during the disorder, although the course of the latter up to that moment may have been perfectly regular. The eruption comes out well, and the reaction is normal; but suddenly and without known cause, without exposure to cold, the eruption disappears, the skin becomes livid, all reaction is abolished, and the child falls into collapse and dies.

Wunderlich also speaks of cases of sudden, or at any rate very rapid death, in the space of a few hours, due to spasm of the glottis, or cerebral apoplectiform symptoms; he even adds that the latter are not at all rare.

These surprises are therefore not so unusual that they can be looked upon as mere pathological curiosities; they ought to be thoroughly known, and yet, as Duclos rightly remarks, they do not occupy a suitable place in recent treatises on the subject. Among the monographs dealing with scarlet fever one only, so far as we know, draws special attention to cases of this kind: Moizard in his article in the "Traité des Maladies de l'Enfance," under the heading "Sudden and Unforeseen Death During the Eruptive Period," cites Duclos's work, and adds, "This is manifestly an insidious variety of malignant scarlet fever, disguised by a mild outset that misleads the physician into a falsely secure state of mind."

A point that is quite as striking as the unforeseen way in which these patients succumb, is the almost perfect similarity in their histories: each one of them is literally a copy of the other. It is always on the fourth or fifth day of the disease that the symptoms appear, and in a very short space of time the patient passes from a relatively satisfactory state of health to one of the utmost seriousness, the temperature rises abruptly, the pulse can no longer be counted, and in two to four hours, or possibly a little more, everything is over. Dyspncea, with or without pulmonary œdema, and the disappearance or cyanotic aspect of the eruption, are inconstant symptoms. It is, in short, the tableau of malignant scarlet fever reduced to its final phase, and suddenly grafted on a case that up to that time had followed a normal evolution.

Less commonly it is somewhat later, when the disease is beginning to decline, that the drama occurs, as in the two following cases.

CASE XIII.—A young man, aged twenty-three, with scarlet fever showed pulmonary congestion. On the sixth day of the disease, fifth day of the eruption, the pulmonary congestion had disappeared. On the seventh, the fever was gone, and the eruption about entirely effaced. That evening the patient complained of depression and lassitude, though there was no headache and his speech was as clear and energetic as usual. At four in the morning the physician was called, as the patient had been seized at one o'clock with agitation and delirium, and he died a few minutes after the physician's arrival (Guéneau de Mussy).

CASE XIV.—Child two years old, with a normal case of scarlet fever, on the tenth day, during the ward visit suddenly uttered several cries, appeared to be suffering in a very strange manner and to be struggling for air, let her head drop on the pillow, and succumbed, the entire scene not having taken more than two minutes (Klose).

A third case, published by Goodall, was as follows:

CASE XV.—A child of eight, with whom on the eleventh day of a moderate case of scarlet fever, without complications or otitis, convulsions set in, died rapidly in coma; but here post-mortem examination showed thrombosis of the right sinus and cerebral veins.

Finally, death may occur in quite as unforeseen a manner, even during convalescence. “A patient recovers from scarlet fever, is convalescent, and you no longer have any uneasiness, when suddenly vomiting begins, similar to that of the early stage, and with this vomiting, delirium, frightful agitation, very rapid pulse, and the patient succumbs in coma or convulsions; yet there was no albuminuria, anasarca, haematuria, or anything to lead you to be on your guard. These disasters occur as well with grown people as with children. It cannot therefore be too often repeated that, in scarlet fever, patients must not be considered cured until some time after the cessation of the final symptoms. There is no more fever, and you speak of recovery, and yet the disease is still to be feared and may rapidly carry off the patient, although there seems to be no cause for apprehension” (Trousseau).

It is the cases of this kind that Moizard describes as the tardy malignant form: “Sometimes,” says he, “malignant symptoms appear late in the course of scarlet fever, whose evolution up to that time may have been perfectly normal, and without it being possible to connect them with any well-defined complication. I have seen a child that had reached the third week of a perfectly regular case of scarlet fever without incident, carried off in a few hours by hemorrhagic phenomena (profuse epistaxis, subcutaneous hemorrhage giving rise to large pouches of blood, and intestinal hemorrhage), accompanied by serious nervous symptoms, and without albumin in the urine.”

Here again death may be absolutely sudden, as during convalescence from typhoid fever. Leichtenstern speaks of three cases

of this kind, occurring in children convalescing from scarlet fever, of whom one had nephritis but no uræmic symptoms. In the three cases death was absolutely unforeseen; with two it occurred when the children sat up to eat or for the bowels, and with the third it happened during the night in absolute tranquillity.

Death of this sort is not rare in scarlatinous nephritis. One of us saw a young girl die in fifteen minutes from an attack of acute pulmonary œdema, although up to that time her nephritis, due to scarlet fever, had given no trouble. In a case cited by Descrozilles, a child suffering from scarlatinous nephritis suddenly said several times in succession that he felt very badly, was seized with indescribable apprehension, called for help, lost consciousness, and died. Similar cases have been published by a variety of authors, and a large number of examples of this kind could be found; but with these patients the prognosis is naturally guarded on account of the nephritis, and the possibility of sudden accidents must be considered. On this account this group should be clearly distinguished from those that have preceded.

It is therefore manifest that death may occur in an absolutely unforeseen manner, and that cases of this sort are not altogether rare. It is either sudden death, or death in a few hours, either in the midst of phenomena of stimulation, or more commonly of collapse, minus the low temperature, which is on the contrary replaced by hyperpyrexia. It is certain that with a knowledge of these cases, and particularly when the physician has seen one himself, it is no longer possible to make a favorable prognosis in a case of scarlet fever, however mild it may be.

How are these disasters to be explained, and what does autopsy show? To the latter question the reply is very simple: in each case in which postmortem was made nothing was found. Some authors note that examination was absolutely negative, and that the heart in particular was perfectly healthy; others mention mere ordinary conditions, such as congestion or anaemia of the brain. In some the myocardium is reported as a little soft, or in a state of partial steatosis,—and that is all.

But almost all of these cases are more or less old ones, histological examination does not seem to have been made, and the attention of the writers was then not drawn to certain organs which can

now-a-days explain many cases of sudden or rapid death,—we refer to the suprarenal bodies.

The postmortem of our patient was performed with the greatest care, without giving any more definite results than was the case with our predecessors; nothing was found to explain this unexpected death. To the naked eye the heart and aorta were normal; the pulmonary bases were congested; there was no very considerable tracheobronchial enlargement of the glands; the liver was normal in size, congested in spots and fatty in others; the spleen normal in size and consistency; the kidneys healthy; the suprarenals normal externally and on section, without hemorrhage, so far as could be judged in a slight stage of decomposition; nothing special was found in the stomach or intestines except a few worms; thyroid and thymus were normal; congestion of the nervous centres was found, without cerebral or mesocephalic lesions visible on section and without increase of liquid—such was the result of the post-mortem examination. Histological examination of the heart and kidney was negative, with the exception of slight alterations of the latter organ; that of the liver gave moderate signs of degeneration; blood culture from the heart and spleen was sterile. The suprarenals were not examined histologically on account of commencing decomposition.

In the absence of pathological data we are reduced in scarlatina, as well as in other infectious disorders, to hypotheses as to the cause that determines death; it is very likely, furthermore, that this mechanism is not always the same one. In the earliest cases, those at the very beginning of the disease, we can only conceive of a form of massive intoxication of the whole central nervous system, giving rise to a short period of stimulation (delirium, convulsions, and vomiting), quickly followed by utter prostration. In the later cases, those following a normal phase, it is possible also to think that the condition of the nervous cells has been modified in some obscure way by the action of the toxins, so that even a slight incidental cause, by producing in their neighborhood some abnormal stimulus, suffices to produce sudden or rapid death. But it is then equally possible to think of myocarditis, or of suprarenal lesions. The former would suffice to account for the sudden cases of syncope; the latter, in view of what we know of the action of the suprarenals in maintaining muscular tonus, would give a more satisfactory

explanation of cases such as our own, in which the salient feature is sudden and complete asthenia; furthermore, all the other symptoms—tachycardia, thready pulse, tendency to collapse and syncope, vomiting, diarrhea, dyspnea, delirium, convulsions, and coma—happen to be exactly those that characterize the acute suprarenal symptom-complex of Sergent and Bernard. Finally, we know that extensive degeneration of the suprarenals may take place insidiously, and be undetected until sudden or rapid death occurs under the influence of a more or less unimportant cause (the apoplectiform, suprarenal symptom-complex of Arnaud), and that, with very rare exceptions, cases of this kind generally occur in young persons between twenty and thirty years of age. Wiesel goes even farther. Failing to find in a young man of eighteen, who succumbed rapidly after a cold bath, anything more than hypoplasia of the suprarenals and of the chromaffin system, he raises the question whether simple insufficiency in the development of this system may not predispose to cardiac collapse through the vascular hypotony that it produces. But in any case this would only be a predisposing cause.

Are we to think that suprarenal lesions are common in scarlet fever? In spite of the assertion of Loeper and Oppenheim, who consider this disease, with diphtheria, typhoid fever, and particularly smallpox, as having an elective action on the suprarenals, we have not been able to find any mention of lesions, and especially of suprarenal hemorrhage, in scarlet fever, though no doubt these organs have hitherto been but little studied, especially histologically, in scarlet fever.

However this may be, and whether they are due to nervous, cardiac, or suprarenal lesions, if the extreme and sudden gravity of the symptoms is thus explained, it seems as though their rapid appearance in the course of a case that up to that time had been normal and mild cannot be satisfactorily understood without the intervention of another factor, such as some slight perturbing agent. Wood is inclined to blame the use of mercurial purgatives, in some cases. Romberg has seen two scarlet fever patients with myocarditis die suddenly, one after a nose-washing, during which he had violently struggled, and the other on going into a vapor bath. Czerny states that several times during infectious cases in childhood he

has had the impression that resorting to a novel therapeutic means that surprised the patient had stopped the heart; he cites the case of a child with slight bronchitis that died suddenly after the first application of a wet pack to the chest, and also that of Langerhans's son who succumbed on the first day of an attack of diphtheria shortly after an injection of serum and manifestly before the serum could have had the slightest effect. He adds that he has never been able to shake off the impression that it was the physical shock and not the infectious disease that had induced this unexpected issue in these cases. With our own patient the serious accident set in after a hot bath; still, the bath itself had been preceded by a certain amount of agitation. It is not without interest to mention that with another little girl, suffering from bronchopneumonia towards the end of an attack of scarlet fever, it was also after a hot bath that there appeared a semicomatose state with slight convulsions, pulse almost uncountable, and temperature of 41.1° , death occurring seven hours later. As to the action of intestinal parasites, it does not seem likely that they have any importance. In a general way, and in most of the cases, no manifest cause can be found; emotion, effort, exposure to cold, and errors in diet seem to have nothing to do with the sudden death.

In the absence of any other explanation are we to fall back on some particular state of the organism? This brings up the question of predisposing causes.

According to certain German authorities these cases of unforeseen death, particularly in childhood and above all in infancy, where they are generally attributed to hypertrophy of the thymus, are due to a peculiar temperament. They occur in fat children (Ettmüller), in fat and lymphatic children (Paltauf), lymphatic and pasty children (Escherich), or children that are overfed (Czerny); and the latter authority adds that it is during epidemics of scarlet fever that the influence of this condition is most evident. "The biggest eaters, the children subjected to steady overfeeding, are those that furnish the highest death rate and that succumb in the first stages of the disease. It is not by mere chance that in an epidemic of scarlet fever we see the children of the well-to-do die more easily than those of the poor. Scarlet fever is the disease that throws into the greatest relief the danger of death from the heart to overfed children."

It should, however, be added that the action of the lymphatic temperament in producing sudden death among children has been formally denied by a number of writers, and in particular by Richter, the latter author basing his opinion on such weighty evidence as statistics of 1797 cases of sudden or rapid death in childhood!

Are we to bring into line fatty overloading of the myocardium? This is not the opinion of the authors first cited, although they attribute the death of these patients to sudden heart failure. In their opinion these fat and lymphatic children are at the same time nervous subjects. Escherich thinks that with them there is a peculiar irritability of the nervous system. Czerny expresses himself as follows: "They are always the offspring of families in which there is some anomaly of the nervous system, and consequently present an hereditary taint. There exist in certain families hereditary anomalies of the cardiovascular innervation, and among nervous children there is a class among which predominate the anomalies of this innervation. These are the children who at the slightest emotion change color, and sometimes have even tachycardia or an irregular pulse; they belong to families in which cases of sudden death have already occurred, not only during infancy but at the adult age." The family character of certain cases of sudden death has, as is known, been noticed by many authors; but the majority of these cases concern very young children, or are based on inadequate information. Still, in the cases of Hedinger (sudden death of six children out of nine), the patients were five or six years old, and according to Gilbert and Baudouin similar instances occur among adults, which would seem to warrant belief in the existence of an actual tendency to sudden death in certain families. It would seem as if unforeseen death in scarlet fever occurs most frequently during adolescence and the beginning of adult age, since the majority of cases that we have mentioned concern patients between twenty and thirty, in spite of the incomparably lesser frequency of scarlet fever at that age.

It is possible, up to a certain point, to connect with the cases of sudden death in mild scarlet fever those of sudden death through syncope that occur in simple angina, of which Brouardel has published three cases in young people.

Unfortunately the histories of these scarlet fever cases are silent concerning the personal and hereditary antecedents of the patients, their constitution and temperament. As regards our own patient, we learned from the mother that she had always enjoyed good health. There appeared to be neither alcoholic nor syphilitic antecedents in the parents; but this was no longer the case with nervous manifestations. The mother, after a severe emotion at the age of seventeen (an attempt at violation on the part of her father), remained in a very nervous condition; on the other hand, five aunts of this child, three on the father's side and two on the mother's, are said to have died from meningitis, either during infancy or adolescence. We can neither be sure of the nature of these cases of meningitis, nor indeed that they were cases of meningitis at all; but the fact remains that five of the patient's aunts died early in life from nervous accidents, and this is sufficient to demonstrate the existence with her of a very heavy nervous heredity.

To sum up—these cases of unforeseen death in scarlet fever, as in other infectious disorders, are still inexplicable, and as regards their cause and mechanism we are reduced to hypotheses of which no one is really satisfactory. In any event it is desirable, in cases of this sort, to institute a careful scrutiny of the personal and family antecedents of the patient, particularly as regards the nervous system, alcoholic, syphilitic, and tuberculous heredity, and the possible occurrence of other cases of sudden death in the family; at postmortem great care should be taken in examining the nervous centres, cardiovascular apparatus, and suprarenals. It is naturally well understood that we must not satisfy ourselves with slight and very circumscribed alterations, and attribute to them accidents which nothing but serious and extensive lesions can explain.

Radiography

THE RADIOGRAPHIC EXAMINATION OF THE GASTRO-INTESTINAL TRACT FROM A PRACTICAL STAND-POINT, ESPECIALLY IN CONNECTION WITH THE DIAGNOSIS AND TREATMENT OF GASTRO-ENTEROPTOSIS *

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A COMPARATIVELY short time has elapsed since the few pioneers in gastro-intestinal radiography demonstrated the practicability and simplicity of X-ray examinations of the stomach and large bowel, but in that short space of time extraordinary progress has been made, because this work was at once taken up and developed by a large number of radiographers, who immediately realized its importance and its wide range of application and usefulness. Now, gastro-intestinal radiography takes equal rank in importance with X-ray diagnosis in connection with diseases and injuries of bones and joints, urinary calculus, and the location of foreign bodies.

Although radiographing the stomach is a comparatively simple and easy procedure in the hands of the radiographer of the present day, the more important task of interpreting the 'skiagraph' in such a manner as to obtain from it all the essential data that it is able to furnish, to render accurate deductions from such information, and to apply the knowledge so gained to practical uses, is by no means easy, but requires a considerable amount of experience, study, and good judgment.

It is essential in the first place that one should be thoroughly familiar with the normal anatomical relations of the stomach, its normal skiagraphic appearances, and the range of variations of

*Read in abstract before the American Roentgen Ray Society, New York, Dec. 28, 1908.

both within normal limits. Generally speaking, the anatomical descriptions of the stomach and of its relations find confirmation in the skiagraph. Nevertheless, a "normal stomach" is in many respects difficult to describe in exact terms, however correct our conception of it may be. This is especially true from the radiographic standpoint, because experience has definitely confirmed the statements made by anatomists to the effect that the organ is, under perfectly natural conditions, subject to considerable variations in respect to its position, size, and shape. If, however, one is familiar with the normal range of these variations, and with certain fixed or but slightly variable anatomical relations, it is not difficult to identify the skiagraphic appearance of a normal stomach. The essential points for the radiographer to remember in this connection in order to interpret skiographs correctly are as follows:

1. *The Cardiac End.*—Because of the secure attachments of this portion of the stomach, it may be regarded as a fixed point, and one that is practically never concerned otherwise in the mechanism of gastrophtosis. Its position is on the left side of the tenth or eleventh dorsal vertebra. From the radiographic standpoint, its level as determined by any points on the anterior aspect of the body need not be considered.

2. *The Pylorus.*—The position of this part of the stomach varies somewhat in normal individuals, even aside from its changeable location as influenced by different degrees of distention. Anatomically it may be authoritatively described as on a level with the first lumbar vertebra, or slightly lower, and just to the right of the median line; and normal variations in location may be measured from this point. Under the influence of distention, it may lie as far as two inches to the right of the midline. This movability is possible because the nearest firmly fixed point of attachment is practically that of the second portion of the duodenum to the spine, on the right side about the level of the first lumbar vertebra. The pylorus, being in front of the spine, of course lies somewhat more anterior than the cardiac opening. These anatomical facts are important in connection with the mechanism of gastrophtosis. In some instances the skiagraph will show the slight dilatation of the *antrum pylori*, especially when this is made conspicuous by more or less of a constriction on its left side. This constriction must not

be mistaken for the pylorus. In perhaps the majority of instances this structure and its appearance in the radiograph are either not present or are not very pronounced.

3. *The Greater Curvature.*—The position of this most dependent portion of the stomach varies considerably, under normal conditions, both in different individuals and in the same individual with different degrees of distention; but, generally speaking, its lowest level should be above that of the normally situated umbilicus, or, better, that of the third lumbar vertebra.

4. *Position of the Stomach.*—The position or general direction is somewhat variable normally, especially with different degrees of distention. The general direction in which the stomach lies, as recognized by anatomists and confirmed by the skiograph, is, under natural conditions and in normal individuals, an oblique one, from left to right and behind forward, and tending more to a horizontal than to a vertical position. An empty stomach *hangs* (from the cardiac end) more nearly vertical than when full, due to the pyloric end falling by gravity. As it becomes filled, the first enlargement is said to be upward, backward, and to the left, and finally forward. In the upper part, distention is in a backward direction, and in the lower part, forward. The pyloric end of the stomach moves further to the right, so that the antrum may be carried beyond the pylorus itself, and as far as 5 cm. to the right of the median line.¹

5. *Shape.*—When the stomach is full, the *fundus* or highest portion of the organ will rise above the level of the cardiac opening, and because it is the highest part, gas is very apt to be collected here, as the skiograph shows. Under such circumstances, this is normally the widest portion of the stomach, which becomes more tubular as the pyloric end is approached. The greatest variations in shape are apt to be found in the pyloric extremity and just below the fundus and cardiac end.

6. *The Lesser Curvature.*—Normally the lesser curvature runs obliquely downward and forward in almost a straight line from the cardiac end nearly to the pylorus, where its direction becomes upward and to the right.

7. *The Gastrohepatic Ligament.*—The normal position of the

¹ Piersol: *Human Anatomy*.

stomach is maintained by the structures suspending it plus the upward pressure exerted by the abdominal walls through the other movable abdominal viscera. Its *suspension* is effected through the firm attachments at the cardiac end, assisted more or less by the lesser omentum and, indirectly, by the attachments of the second portion of the duodenum. The lesser omentum is attached along the entire length of the lesser curvature and the first portion of the duodenum, and above, to the under surface of the liver. Its structure is not such as to withstand any unusual amount of strain, especially its middle portion, which is practically no more than a thin and delicate membrane. Comparatively little strain is imposed upon this portion under normal conditions, but it would naturally be the part to yield most readily when subjected to the influence of any long-continued unnatural weight.

Very nearly all of the abnormal conditions of the stomach which can be studied to advantage by means of the X-ray are in some way or another directly or indirectly related to *gastrophtosis*. A comprehensive consideration of the subject of *gastrophtosis* will be employed, therefore, as a convenient means of presenting the practical aspect of the X-ray examination of the stomach.

Any permanent abnormal alteration in the position of the stomach is an indication of some defect in the mechanism of its support, whatever may be the cause, but does not necessarily imply *gastrophtosis*. As a rule there is no difficulty in recognizing the existence of actual ptosis from the radiographic appearance, but in some instances certain essential features of *gastrophtosis* may be shown when this condition, strictly speaking, does not exist. This applies especially to decided variations in position. In *gastrophtosis* the stomach is usually found to have assumed a more vertical position than normal, and the greater curvature is below the level of the third lumbar vertebra. Neither of these changes alone, nor even both together in some instances, should be regarded as absolute evidence of ptosis. The mere fact that the shadow of the stomach indicates that its position at the time of the exposure was vertical, or that its greater curvature was below the umbilicus, or that both of these altered relations existed, does not necessarily imply a true *gastrophtosis*. Reference has previously been made to the fact that a normal stomach which is almost empty may assume a nearly

vertical position, for the reason that the pyloric end, which is itself not firmly attached, may drop to a relatively low level. Under such circumstances, a mistaken diagnosis of gastrophtosis would be avoided by careful attention to the details of the technic of the examination.

Such conditions as unusual distention, moderate dilatation without actual ptosis, or an enlarged liver, may cause the greater curvature to drop below the umbilicus without an actual gastrophtosis being present. A growth of the liver or pancreas could force the stomach into a vertical position and the greater curvature below its normal level; and yet, strictly speaking, this would not be an instance of gastrophtosis, or if it were considered so it would be but an unimportant result of a far more serious condition.

Characteristic alterations in the position of the stomach and the descent of the greater curvature considerably below its normal level are sufficient data upon which to base an X-ray diagnosis of gastrophtosis in the large majority of instances, but errors will frequently arise unless many other important facts are determined from the skiagraph. Moreover, an examination which determines simply the existence of gastrophtosis, and nothing more, furnishes information which is of comparatively little *practical* value by itself. If the proper technic has been employed in the examination, a radiograph of average quality should be capable of imparting much additional knowledge, and if thoroughly interpreted, it should be a reliable means of determining, directly or indirectly, such facts as the chief causes of the condition and the essential factors involved in its mechanism. The skiagraph can frequently be found useful in indicating the anatomical defects most in need of correction, or those whose correction is most likely to be followed by favorable results, and in suggesting the most appropriate measures to employ. It has frequently happened in personal experience that such questions as these have arisen, directly or indirectly, in connection with the radiographic consultation, and in many instances questions of this sort have been asked directly, because of the fact that the most correct solutions are frequently to be found in the skiagraph. In the majority of instances, any or all of these facts can be determined from the average radiograph, if it be properly interpreted.

The following important data can be derived directly or indirectly from the radiograph, and as many of them as possible should therefore be determined in every examination for gastrophtosis:

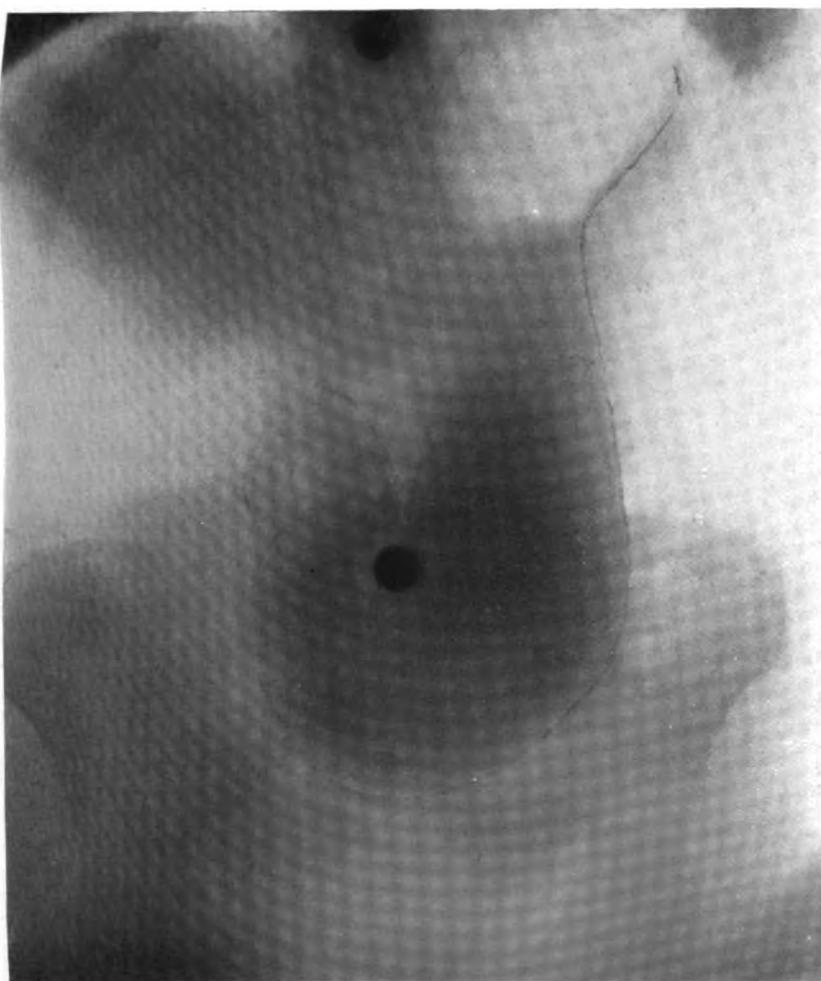
A. INDICATIONS OF PTOSIS

1. *Position of the Stomach.*—In perhaps the majority of instances the general direction of the stomach in the erect posture is found to be more nearly vertical than normal, and in the tubular and the sagging types (Figs. 1, 2) of gastrophtosis it is absolutely vertical. It is always important to bear in mind in this connection the variations that are possible in the position of the normal stomach. Mention is made by anatomists² of a tubular stomach, which is perhaps more or less the result of the persistence of the fetal form, with a lack of development of the fundus. This should not be confused with the recognized *tubular type* of gastrophtosis.

The position of the stomach in ptosis is influenced to a considerable extent by the position of the pylorus, as is the case normally, and somewhat also by that of the liver, the amount of relaxation of the gastrohepatic ligament, and the degree of dilatation. In the examination for ptosis, it is important to determine approximately the greatest degree of ptosis that is likely to exist under ordinary conditions. The one important posture in the examination therefore is the erect one. One reason why clinical examinations often fail to reveal slight degrees of ptosis that are shown by the skiagraph, or the extent that the latter indicates, is the fact that the former is made with the patient in the recumbent posture. Another essential point in the technic that is often given too little attention is in regard to the amount of contents in the stomach. Gastrophtosis is not only greatest when the stomach is full, but it may exist and not be demonstrated by the radiograph if the organ be empty when the relatively small bulk of the bismuth mixture is administered. If the examination be made as soon as possible after a meal of average size and eaten at home or the accustomed dining place, the radiograph will then represent the existing conditions under the most natural and desirable circumstances, and the patient's stomach will contain the greatest amount possible with the least discomfort or feeling of repulsion. Liquids

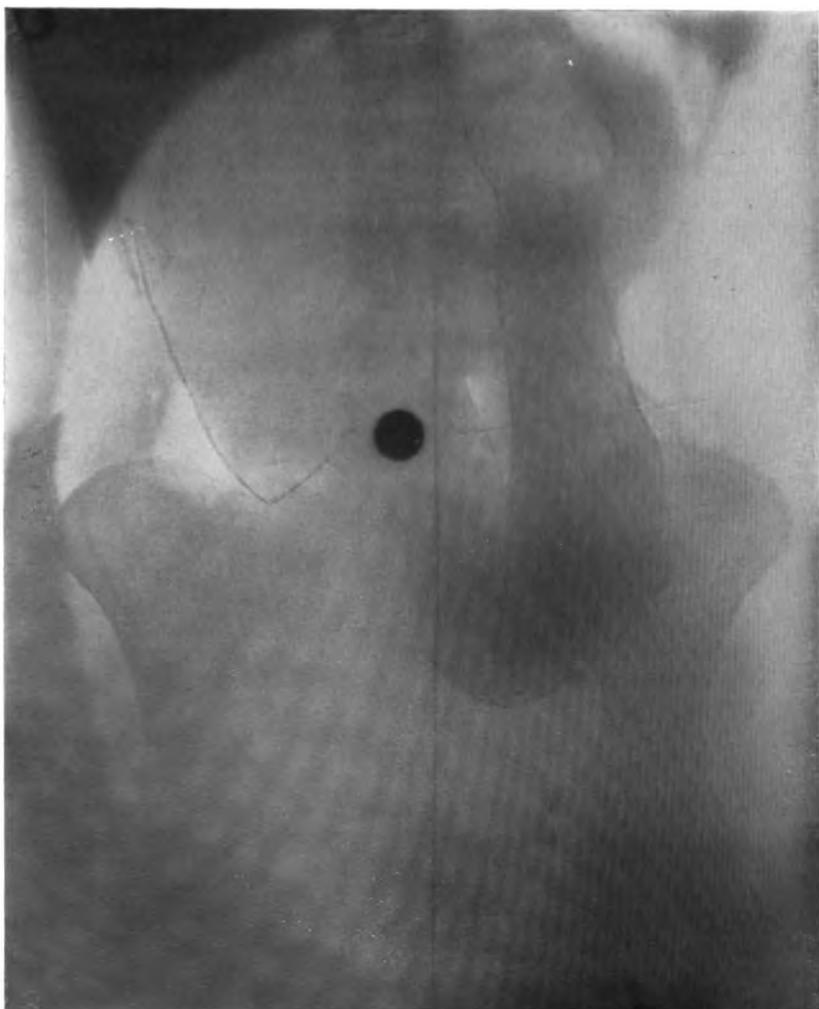
² Piersol: *Human Anatomy*.

FIG. 1.



Extreme gastroparesis, sagging type, with dilatation. Note absence of a duodenal traction kink, and the free exit of bismuth. Erect posture, plate anterior.

FIG. 2.



Marked gastrophtosis, without much dilatation. A "pyloric kink" indicates a stretched ligament (see liver shadow) and suggests the possibility of a duodenal traction kink, which is not shown, however. Clinically there was periodic retention, which probably occurred whenever a duodenal kink became active. Same posture as in Fig. 1.

should not form too large a part of such a meal, as they are not apt to remain in the stomach sufficiently long in most instances. These remarks are not intended to apply to every stomach examination, as there are numerous instances in which the presence of food recently ingested is most undesirable.

2. *Shape*.—The characteristic shape of the stomach is preserved to some extent in perhaps the majority of cases. Aside from the tubular type of gastrophtosis, in which there is little resemblance to the typical shape, conspicuous departures from the normal are largely effected by dilatation and the condition of the muscular coats, as in the "sagging" type (Fig. 1).

3. *Position of the Greater Curvature*.—This is of course the essential point which determines the existence of ptosis, and also its degree. The standing or erect posture and full stomach are absolute necessities in the accurate determination of the lowest level of the greater curvature. If this be found abnormally low, it is often necessary to determine whether the condition causing it to be so is primarily and essentially one of ptosis or of dilatation, which can usually be done by means of the skiagraph.

B. FACTORS IN THE MECHANISM OF PTOSIS

4. *Position of the Pylorus*.—The position of this portion of the stomach, when it can be accurately ascertained, is one of the most important points to be observed in the skiagraph, next to those which determine the diagnosis of the condition. Although the pylorus is but indirectly concerned in the mechanism of ptosis, its relative position plays an essential part, primarily, in the deduction of other important facts, such as the possibility of retention, its cause, the existence of pyloric or duodenal "kinks," and the condition of the gastrohepatic ligament; and, secondarily, in influencing suggestions concerning methods of treatment. In cases of marked ptosis the pylorus is usually found at a lower level than normal, and in extreme cases it has been observed as low as the fifth lumbar vertebra. Under normal conditions it may receive some support, theoretically at least, through the gastrohepatic ligament, but in ptosis this structure may be practically disregarded as a support to either the pyloric region of the stomach or the first portion of the duodenum. The descent of the pylorus will be

limited therefore by the firm attachments of the second portion of the duodenum. It seems almost incredible that these firm attachments would permit the duodenum to be dragged downward to the extent which would correspond to the apparent downward displacement of the pylorus. The existence of a congenital low pylorus or duodenal attachment would account for these displacements to a certain extent, and there is authoritative ground for believing that such congenital defects do exist. They would seem, however, to be more appropriately related to the typical tubular types of gastrophtosis, and even were their existence undenialble, it would not disprove the possibility of an acquired low duodenal attachment. Taking another point of view, it is quite likely that the assumed position of the pylorus in the skiagraph is very often largely or entirely supposititious, for the pylorus itself and the duodenum are by no means always distinctly indicated, and frequently cannot be seen at all. This is especially the case in extreme degrees of ptosis, and the difficulty arises either from too long radiographic exposures, or from the entire absence of bismuth in these structures, or the lack of a sufficient quantity to produce definite shadows, as a result of an accompanying and exaggerating dilatation, of lack of motility, of the position of the stomach in the erect posture, or of a "kink."

The position of the pylorus is of course most accurately determined with the patient in the erect posture, but in many instances in which it is not clearly shown in this way, it may be made to appear with unusual distinctness by examining the patient in another position, especially a lateral recumbent posture, preferably with the plate anterior. A ptotic stomach will fall over to the side on which the patient lies, leaving the pyloric portion uncovered. The right lateral recumbent posture (Fig. 3) is perhaps preferable, because there is the additional advantage in the stomach dragging the pylorus into a position in which it can be more readily observed. In the opposite posture it is apt to be carried in front of the spine. The one objectionable feature in this procedure is the question as to whether the pylorus will be shown at as low a level as in the erect posture. While this part of the stomach is undoubtedly shown to better advantage in many instances in the right lateral recumbent posture, its exact position should always be based upon

FIG. 3.



Case of moderate gastroptosis in which an extreme and far more than commensurate ptosis of the colon was probably an important factor in the mechanism, and possibly largely responsible for the decided duodenal traction kink. The latter is shown to better advantage in this radiograph, made with the patient in the right lateral recumbent posture, plate anterior.

observations made with the patient standing or sitting. If this is not possible, its location may be more or less hypothetical.

The position of the pylorus is the most important means of determining the existence of the distinctive type of mechanical obstruction so frequently associated with gastrophtosis, and in a great measure due to pyloric displacement. Whether the firm duodenal attachments admit any displacement or not, the second portion remains firmly fixed wherever its point of attachment happens to be. The relatively movable pylorus and first portion can be displaced downward to an extent which is limited finally by the duodenal attachments only. Under normal conditions the junction of the first two portions of the duodenum is usually marked by a rather sharp turn, and the more vertical the first portion becomes the sharper will be this bend. Under the additional influence of an actual drag upon the latter by the entire pyloric portion of the stomach, this naturally sharp bend may become an actual kink, capable of offering sufficient resistance to the outflow of gastric contents to act as a potent factor in causing retention. Such a condition of affairs is well recognized radiographically, but its actual existence is to a certain extent hypothetical in many instances, because it cannot always be actually demonstrated. When it is shown in the skiagraph, the appearance is typical, the sharp angle (Fig. 3) in the duodenum appearing in marked contrast to the normal curve (Fig. 1). Such a kink may be inferred, however, when there is a decided downward displacement of the pylorus associated with evidence that neither it nor the first portion of the duodenum receives any direct support through the gastrohepatic ligament, or with signs of stretching or elongation of the latter. The best evidence of an *extreme* degree of relaxation of this structure is to be found in what we have termed a "*pyloric kink*." As the *duodenal* kink is so seldom practically demonstrable, it has been our custom to regard this "*pyloric kink*," together with a low pylorus, but at the same time relatively high as compared with the level of the greater curvature, as significant of a degree of mechanical resistance conducive to retention.

5. *The Gastrohepatic Ligament.*—Relaxation or stretching of this more or less theoretical supporting structure of the stomach is another important factor in the mechanism of gastrophtosis. It

cannot, of course, be shown in the skiagraph, but in most cases the extent to which it has been stretched, if any at all, may be calculated with a reasonable degree of accuracy. A careful radiographic and anatomical study suggests three ways in which it may be advantageously considered in connection with *gastroptosis*. First, it is important to know just what part it plays normally in the support of the stomach. We may assume primarily that the cardiac end of the stomach is the one part in which the attachments remain unchangeable, and which therefore does not undergo displacement. If the normal position of the organ were vertical, ptosis might almost be regarded as a theoretical impossibility. But in the oblique position in which it lies, its weakest support is along the lesser curvature. The duodenum, through the firm attachments of its second portion, must be regarded as an essential part of the supporting mechanism, and is probably next in importance to the one just mentioned and the abdominal walls. The structure of the *gastrohepatic ligament* would hardly permit the latter to play much of a part in the support of the stomach, and in fact it is questionable whether this weak structure really has anything whatever to do directly with support of the organ.

A second important consideration of this ligament is the effect of the ptosis upon it. Whatever its function under natural conditions, it is not so constituted as to withstand any great amount of unnatural weight, but will readily give way when dragged upon. It is not unreasonable to assume that when the pyloric end of the stomach drops, relaxation or stretching of this ligament could continue until the downward displacement met with strong resistance from the next strongest support, namely, the duodenum. At this juncture, any supporting influence of the ligament would be advantageous in tending to prevent a kink; but it is evident that relaxation can continue still farther, and instead of a stomach somewhat U-shaped, as is sometimes observed and especially noticeable when there is a uniform dilatation, the characteristic "pyloric kink" appears, and the position of the organ becomes vertical.

The third important point in connection with this structure is in regard to certain methods of treatment. A knowledge concerning the degree of relaxation of the *gastrohepatic ligament* is indispensable in connection especially with those cases in which radical

procedures such as the Beyea operation are to be considered. This is the typical operative procedure for creating a support to take the place of that which would be the function of a ligament capable of bearing some weight. The essential feature of such an operation is to unite the gastric and hepatic attachments of the gastrohepatic ligament, making a firm supporting structure, and not attempting to utilize the flimsy structure of the ligament itself for the purpose. The two important indications of a stretched ligament are the existence of a "pyloric kink," or a tendency thereto (Fig. 1), and of an appreciable space between the lesser curvature and the under surface of the displaced liver (Fig. 2). Of course the patient must be examined in the erect posture and the stomach should be full in order to obtain any accurate knowledge concerning this structure, and in addition, the position of the pylorus should be determined as precisely as possible.

6. *The Liver.*—In practically every case of gastrophtosis there is found to be more or less associated ptosis of the liver (Fig. 2). Whether the displacement of the liver is ever a result of gastric ptosis has not yet been determined. It is most likely due to much the same cause or mechanism as gastrophtosis in a certain number of instances; and from the radiographic standpoint there is very good reason for believing that it frequently plays the part of an important factor in the mechanism of ptosis of the stomach.

Ptosis of the liver does not imply that the organ drops directly downward, for the displacement consists in a rotation forward or laterally, or both, permitted through a relaxation of all its attachments, plus a lack of normal support from below. In many instances there are the additional factors of pressure, as from tight lacing, and lack of space, resulting from the contracted thorax seen so often in the characteristic build of many gastrophtosis patients and in the phthisical chest. If the stomach receives any support from this organ through the lesser omentum, rotation of the liver would naturally tend to favor gastrophtosis through the dropping downward of this support, or it might possibly exert some influence upon the displacement of the pyloric end by dragging upon the lesser omentum. A general enlargement of the liver or a downward displacement due to pressure directly from above would perhaps tend to push the pyloric extremity of the stomach downward, but a

displacement of the latter due to such factors alone could hardly be regarded as a true *gastroptosis*. Finally, it is possible that in its true type of ptosis the liver may have a tendency to push the pyloric extremity down. It is rather difficult to realize just how a rotation of the liver could exert very much influence in this way, but that it does do this to a certain extent is strongly suggested by the fact that it is often difficult or even impossible to bring the stomach into anywhere near its normal position by the operation for shortening the *gastrohepatic ligament*, or even by other methods, on account of the position of the liver.

A radiographic determination of the position of the liver is important for many reasons. First, its displacement is additional evidence of a tendency toward general *visceroptosis*. Secondly, its position is important in determining the length of the *gastrohepatic ligament*. Thirdly, it is a factor which must enter into the calculations for estimating certain of the results accomplished by certain measures of treatment in *gastroptosis*, such as the operation for suspension by means of a new *gastrohepatic ligament*. The amount of its displacement must be taken into consideration in order to determine the anatomical results, at least, after such procedures. In cases in which ptosis of the liver is very marked, it cannot be expected that the stomach will be returned to its normal anatomical position. The information furnished by the radiograph concerning such facts has already tended to impress upon surgeons the importance of the position of the liver, and as a result attempts have been made in many instances to correct the hepatic displacement as well as that of the stomach.

7. *The Colon*.—There is usually no difficulty in recognizing the existence of any very marked degree of ptosis of the colon, nor in identifying its normal position, but it is not always an easy matter to differentiate between slight displacements which may be regarded practically as normal, and those that are to be looked upon as pathological in one way or another. More or less ptosis of the transverse colon is invariably associated with *gastroptosis*, but the flexures do not always share in the displacement. In cases of *gastro-enteroptosis*, the position of the hepatic flexure may be influenced to some extent by that of the liver, and as this portion of the colon is very often found to be ptotic, we may regard the hepatic

displacement as a possible cause in many instances. The facts that ptosis of the liver is a rotation, and that this part of the colon is not directly attached to that organ, are probably the principal reasons why displacement of the hepatic flexure is not more frequent. This part of the colon, however, is attached to the lower part of the right kidney, and nephroptosis, being a condition frequently associated with gastrophtosis, would seem to be a more potent factor, and either alone or in conjunction with the dragging of the ptotic transverse portion it is the most likely cause of displacement of the hepatic flexure. The splenic flexure is found displaced much less frequently. In its peritoneal attachments it is more closely related with the spleen and abdominal paries than with the left kidney, and its relations with the liver and stomach are less likely to favor ptosis, comparatively, than are those of the hepatic flexure. The splenic flexure is frequently displaced, however, and to a slight extent more often perhaps than is realized.

As more or less ptosis of at least the transverse colon is invariably associated with gastrophtosis, the former cannot be fully considered separately from the latter. In the majority of instances ptosis of the colon is either a result of gastrophtosis or occurs through the same mechanism in conjunction with the latter. But it may, of course, arise independently, either as a result of a mechanism similar to that of gastrophtosis, or from widely different causes, such as adhesions, chronic constipation, etc. Under such circumstances it may exist as an independent condition for a time, but gastrophtosis is quite likely to occur sooner or later as a result. Primary ptosis of the colon must, therefore, be regarded as the essential etiological factor in many cases of gastrophtosis, as well as recognized as an inevitable result of the latter.

In view of these facts, the importance of determining the position of the colon as well as that of the stomach in examining cases for gastrophtosis is evident, for the displacement of the bowel may be such as to need correction. The success of an operation may be greatly impaired through failure to observe the position of the colon, or even a second operation may be necessitated. The colonic displacement is likely to be relatively greater when it has arisen independently and is an essential factor in causing the gastrophtosis. The bismuth enema is unnecessary in this connection, as a second

examination made twelve to eighteen hours after that of the stomach will serve to show the position of the colon sufficiently well without the administration of any more bismuth.

8. *The Support of the Abdominal Walls and Contents.*—Although this is a factor of extreme importance in the mechanism of gastrophtosis, its consideration here is of comparatively little importance, as it is more directly concerned with the clinical examination. It is a part of the clinical evidence, however, that should be considered in conjunction with that derived from the radiograph. The principal application of the X-ray examination in connection with this factor is along such lines as studying the influence that certain uses of the abdominal muscles exert or determining what effect artificial means of support such as binders have upon the position of the stomach.

9. *The Patient's "Build."*—The characteristic build peculiar to the typical case of gastrophtosis and the type of chest associated with pulmonary tuberculosis are important factors in the mechanism of gastrophtosis, but the remarks just made, together with certain statements in connection with the discussion of the liver, render further consideration of this topic unnecessary.

10. *Adhesions.*—Adhesions may be regarded as a definite though comparatively infrequent cause of gastrophtosis. As such, they may constitute the factor primarily concerned by dragging directly upon the stomach, or indirectly through the colon, or the ptosis may be secondary to an obstruction caused by the adhesions. It is, of course, impossible to radiograph adhesions, but their presence, and especially their location, may be indirectly suggested in many instances, particularly when they involve the transverse colon.

11. *Dilatation.*—Radiographic studies of the stomach have been of much service in dispelling the confusion which has existed in connection with the relations between gastrophtosis and dilatation. A clinical examination may show the greater curvature well below the umbilicus, but to determine exactly whether this results from a true ptosis alone or from dilatation alone, or from both, is a matter of some difficulty clinically, but radiographically it is as a rule quite simple. From the X-ray standpoint dilatation may be considered in three ways, namely, as a result of gastrophtosis, as a cause of the latter, and as a more or less independent condition.

Perhaps most frequently it is an early or a late result, due to the various forms of *mechanical* resistance associated with ptosis and favoring retention, such as the kink, and further augmented by the progressive weakening of the stomach walls. Evidences of these, when associated with dilatation, strongly suggest that the latter is secondary to the gastrophtosis.

Dilatation may undoubtedly be regarded as an occasional primary cause of gastrophtosis, the former condition in such instances having arisen through factors independent of those concerned in the latter—as organic obstruction, for instance, and, rarely, acute dilatation. At a comparatively early stage in such cases, before either dilatation or ptosis has become excessive, it will usually be found that the stomach has not assumed a strictly vertical position, but still retains more or less of its obliquity, because the pyloric extremity and the lesser curvature have not become active participants in the process of the displacement, and because the liver is not as a rule ptotic to the extent commonly observed in cases of primary gastrophtosis. The skiagraphic appearance is so characteristic in many instances as to suggest a distinct type of ptosis. Clinical data are of course an essential adjunct in such cases for the correct interpretation of the radiograph. A history suggesting organic obstruction, such as chronic ulcer or carcinoma, is as important to the radiographer in many respects as to the clinician. It is often very important to be able to distinguish radiographically between a dilatation causing ptosis and one resulting therefrom, and this can usually be done; but in some instances dilatation may be so extreme that it is impossible to identify it as primary or secondary.

Dilatation may also exist as an independent condition without actual ptosis being present, although the latter is most likely to follow sooner or later. The level of the greater curvature will of course be abnormally low, as that of a dilated stomach practically always is; but a diagnosis of gastrophtosis should never be based solely upon a downward displacement of the greater curvature.

The exact degree of dilatation cannot be determined skiagraphically unless the stomach is filled to the extent of its own average capacity at the time of the examination, and of course the erect posture is essential. In cases of extreme dilatation, good clear pictures are by no means always obtainable, because the bismuth is so widely distributed.

C. INFREQUENT FACTORS, RESULTS, ETC.

12. *Retention and Motility*.—These terms are by no means synonymous, but they are often so used, either intentionally through ignorance, or carelessly. Applying them strictly in accordance with their true significance, *retention* expresses a *result* of derangement of mechanism or of disordered function, and implies an inability of the stomach to empty itself *completely* through the natural outlet. *Motility*, on the other hand, relates to varying conditions of a single function of the organ—that of its motor mechanism. The latter may constitute the sole cause of the former, but usually retention arises primarily through some form and degree of resistance offered to the exit of food, which the function of motility is unable to overcome completely. Aside from any general causes of muscular weakness, those with which we are most concerned as factors influencing motility are, with the possible exception of acute dilatation, primarily the same as those responsible for retention, which, if continuous, usually affect the muscular mechanism to the greatest extent through dilatation. Before dilatation results, the increased effort to overcome resistance is manifest often in hypermotility. This latter term is somewhat ambiguous, however, as it is also employed in the expression of quite a different phenomenon, in which resistance plays no part, namely, the too sudden exit of food from the stomach.

Retention, lessened motility, and hypermotility are all conditions that may be related with gastrophtosis. Hypermotility of the latter type can hardly be regarded as a factor in ptosis, but it may be considered with more or less doubt as a possible result, and it is certainly very often associated with gastrophtosis. The rapid escape of bismuth through the pylorus cannot be regarded as a reliable indication of hypermotility, because bismuth, especially when administered in suspensions, is very apt to begin its exit almost immediately after ingestion, unless there is considerable resistance of some kind offered. Moreover, this is a condition in which the characteristic clinical feature is the exit of food before its proper digestion, and even were the bismuth intimately mixed with the food before ingestion, its value as an indicator with reference to the exit of food would be uncertain. If hyperperistalsis plays a prominent part in the process, however, the X-ray examina-

tion is sometimes capable of imparting some information. The other type of hypermotility, which is essentially a hyperperistaltic effort to overcome the resistance of some temporary form of obstruction or a permanent one of recent origin, is also amenable to examination, and under some circumstances data of considerable importance are obtainable.

Both lessened motility and retention can be determined radiographically as existing conditions, but the importance ascribed to such examinations for purposes other than this alone, and likewise the accuracy of the data derived therefrom, are questionable. An examination which shows the presence of bismuth in the stomach in comparatively large quantity several hours after its administration is evidence of *retention*, and its determination radiographically is under some circumstances important. But it is a condition which as a rule can be determined just as well, and studied to far better advantage, clinically. A far more important use for the X-ray examination is the determination of the *cause* of the retention, and in this application its service is invaluable.

It is difficult to conceive how exact knowledge concerning the extent to which motility is impaired can be derived from the radiographic determination of the existence of retention, for the reason that in any precise estimation of the motility the value of the factor of resistance must be taken into account. Under such circumstances gastric motility can be no more accurately calculated from retention than can the muscular tonicity of the bladder be estimated from vesical retention in a case of prostatic hypertrophy. Even some delay in the escape of bismuth from the stomach does not necessarily imply lessened motility, as this may be due altogether to obstructive resistance. The only way of estimating motility, and especially lessened motility, with any reasonable degree of accuracy would seem to be by the use of the fluoroscope, should any examiners feel inclined to employ this method. The most accurate knowledge obtainable from the radiograph is derived from inferences regarding the condition of the walls of the stomach drawn from the skiagraphic appearance of the organ, and from certain appearances indicative of vigorous peristaltic contractions, but usually shown by very rapid exposures only. A sagging or markedly dilated stomach naturally implies lessened motility, as

does also to a certain extent retention when not due to organic obstruction; but none of these conditions suggest the degree of impairment. On the other hand, the transitional type of ptotic stomach without dilatation is evidence that motility is not impaired to any extent, if at all.

Even if impairment of motility could be determined with any exactness, the direct importance of its determination, although it has received much attention, is extremely doubtful, and the repeated examinations often considered necessary for the purpose constitute a procedure more of interest than of practical utility, especially in view of the time and trouble expended. Although this statement is an expression of personal belief, it is by no means based entirely upon personal reasons, but is substantially and authoritatively supported by the fact that in not a single instance has a repeated exposure been desired for the purpose of securing data concerning motility, out of nearly 250 cases so far referred for examination for gastrophtosis.

13. *Organic Obstruction*.—This term is used here in connection with cases of carcinoma and cicatricial stenosis in which the lesions, from their nature and locality, offer resistance to the exit of contents from the stomach. All reference to the diagnosis of the conditions themselves will be omitted here, as it forms the topic of another paper. Widely different changes may be induced in the stomach as a result of such forms of obstruction. Dilatation ensues in a large percentage of cases, and it may simulate ptosis because of the downward displacement of the greater curvature, or it may in rare instances produce a condition which amounts practically to a gastrophtosis. In cases of this kind, the usual appearance differs materially in many respects from that of a true gastrophtosis, and in many instances it is so characteristic as of itself to suggest strongly organic obstruction.

Pyloric spasm may in some respects be regarded almost as a form of obstruction. As a rule, such a condition cannot of course be determined directly by the X-ray examination. In the one case of this kind examined, a definite diagnosis of pyloric spasm was unhesitatingly advanced upon the basis of the data derived from the radiographic examination in conjunction with those deter-

mined by clinical methods. The case is mentioned as an instance of the more remote possibilities in X-ray diagnosis when skiagraphic and clinical methods are judiciously employed in conjunction.

14. *Hour-glass Constriction*.—Such a condition is occasionally associated with gastrophtosis, and when present its appearance is characteristic and unmistakable. But the typical appearance is very often simulated, and sometimes very closely, and the condition may be suggested when it is not present. One should not be too hasty therefore in making a positive diagnosis, and no matter how typical the features presented may seem, definite conclusions should never be based upon the results of a single examination, especially as this condition is likely to be a manifestation of another of a very serious nature. At least two separate examinations should be made, one with the stomach empty except for the bismuth mixture, and one with the stomach distended as much as possible; and, as a further safeguard, it is well to examine the patient in more than one posture.

SUGGESTIONS IN REGARD TO TREATMENT

In the foregoing consideration of the factors, indications, and results of gastrophtosis, numerous scattered references have been made to the value of the radiograph in offering suggestions in regard to treatment. Unquestionably the skiagraph, when judiciously interpreted, is capable of rendering much valuable assistance in this respect, and this should be regarded as one of its most important purposes. Suggestions of this kind are derived mainly from the determination of certain of the important anatomical defects and the estimation of their extent and influence, either directly from the skiagraph or indirectly from such indications as it will furnish. In the first place, the examiner must be familiar with the various forms of operations employed in connection with gastrophtosis, in order that he may be able to recognize whether any operative procedure at all is indicated, or whether there are special indications for one or more of the particular forms of operation employed. An accurate conception of the clinical aspect of the case is most essential in this connection.

Those indications which may suggest the necessity of some form of operation as the only means of affording any reasonable amount of permanent relief are, especially, marked dilatation, retention, and evidence of a mechanical kink and of a relaxed gastrohepatic ligament. Organic obstruction is usually to be regarded more in the sense of a distinct condition in itself than as a factor concerned in gastrophtosis. It is of course never justifiable to operate solely upon the radiographic evidence concerning these points, but such indications as are apparent should always be subjected to appropriate modification by the clinical aspect of the case before their actual practical significance is construed. The above indications have been fully considered in connection with the factors in gastrophtosis. As a rule, the greater the anatomical defect the easier is its detection and the estimation of its importance as a factor. If a stomach is in a vertical position, and ptotic to an extreme degree, and there is evidence of a relaxed gastrohepatic ligament and of a greatly weakened musculature, as indicated by distinct sagging, retention, or marked dilatation (Fig. 1), it is hardly likely that a binder or other form of artificial support, or exercise of the abdominal muscles, straightening of a spinal curvature, or development of the chest will correct these abnormalities to any great extent. A binder may *elevate* the stomach, even to a position approaching the normal, and a radiographic study of its effect upon the position of the organ may be very interesting, but the skiagraph will also show that such measures afford but temporary symptomatic relief in these extreme cases. Relief of symptoms is due mainly to the fact that the support lessens the dragging and thereby tends to overcome mechanical retention to a certain extent, but this will not materially correct the relaxed and stretched mechanism of suspension, nor will it fully overcome the retention due to the dilatation or stretched walls of the stomach. However, in the less marked types of ptosis, in which the position is not yet vertical, the lesser omentum not much relaxed, mechanical obstruction by traction has not become an active factor in retention, and dilatation is not marked, such measures are likely to succeed in many instances, and are indicated primarily in preference to operation. It is not difficult to distinguish radiographically between two such types of cases.

In many instances the radiograph is capable of still further valuable service in pointing out indications for special forms of operations. Evidence of marked stretching of the gastrohepatic ligament may influence the surgeon in making the correction of this defect an important or even the sole feature of his operation. If there is strong evidence pointing to a traction kink as a potent factor in retention, whatever the method to be employed, the elimination of such obstruction must be an essential object. An extremely low greater curvature or marked dilatation may indicate the necessity of other or additional methods of suspension, such as fastening the great omentum or the gastrocolic omentum to the anterior abdominal wall, as is frequently done. In a similar manner the radiograph may show that even the most complete suspension will not be likely to overcome fully the retention, and that additional artificial drainage, such as by a gastro-enterostomy, will be required for this purpose.

Radiographic observations should not be restricted solely to such points as have just been mentioned, but they should include a study of the positions and relations of other structures, especially those of the colon, liver, and kidneys, particularly in cases in which operations are considered. It is important to know both the position of the colon and the possibility of its displacement having any influence upon that of the stomach. In some operations for gastrop-tosis a suspension of the colon is one of the secondary features; but where this is not the case, it is important to determine beforehand whether or not an additional suspension of this structure will be necessary in order to overcome all difficulties. It should be borne in mind by all concerned that at the time of operation the surgeon cannot always find conditions exactly as they existed under far more natural circumstances for the patient and as indicated by the radiograph. A correction of the gastric displacement alone when there is also an extreme ptosis of the colon is likely to leave the latter uncorrected, and in consequence such symptoms as were related to it will continue; or only a part of the colon will be pulled up with the stomach, thereby forming a redundant loop or increasing any tendency toward kinking at the flexures or elsewhere.

It is important to determine the positions of the kidneys because

there may be a nephroptosis which is more concerned in the symptomatology than is the gastric displacement, and if there is to be a choice between two operations, nephorrhaphy may be the one most indicated.

The amount of rotation or ptosis of the liver is important in many instances because of the possibility of its being an obstacle to any near approach to a normal anatomical replacement of the stomach. As previously stated, the importance of the hepatic displacement is being more and more realized, and some operators are attempting to fix this organ in position in connection with replacement of the stomach.

The important fact should be borne in mind in this connection that it is not the radiographer's place to suggest any method of operation to the surgeon, but simply to render an interpretation of the negative concerning these points. It is the surgeon's business to decide upon the operation, and he consults the radiographer for information concerning existing conditions.

RESULTS OF TREATMENT

In cases in which non-operative measures have been employed, the clinical indications of improvement or cure are amelioration of symptoms or their entire disappearance. It is important, however, in estimating the actual result to know the real extent of the correction of anatomical defects. The skiagraph is not only the most accurate means of determining this, but it may in addition suggest the likelihood of permanent success or of ultimate failure. Great care should be exercised in order to render such examinations accurate. It is important that each be made under exactly similar conditions. The patient should wear a binder if the effect of the binder is to be studied, but the examination should be made with it off if the result accomplished by wearing it is what is desired.

Likewise, the radiograph is the most accurate means of determining the exact anatomical result of an operation, and especially the extent to which previously existing defects have been corrected. Here again the examination should be made under exactly similar conditions. Both stomach and colon should be examined and the comparison should take into account each point that was regarded as in any way important at the pre-operative examination.

THE INTESTINAL TRACT

The foregoing remarks have included practically all that is important concerning the intestinal tract in connection with ptosis, with the exception of one portion of the latter structure, the *sigmoid*. The bismuth enema is best suited to the examination of this structure except in some cases of obstruction, when it may be advisable to introduce the bismuth from above by mouth, or even both ways. Other important uses of the X-ray examination are the determination of ptosis, redundancy, the presence of kinks, and the results of operations. There are of course other important but less frequent applications. The sigmoid presents many difficulties to its examination. Both its position and its radiographic appearance are very variable within normal limits, and one must become familiar with the general normal appearances before attempting to render correct diagnoses.

Redundancy is more frequent and far more difficult to determine radiographically than *ptosis*, mainly because of the reduplications or twists and the resulting superimposition of shadows, even in the normal individual, and especially when this portion of the gut is distended.

One should be very careful about making a diagnosis of obstruction involving the first portion of the sigmoid, which lies in the iliac fossa and which is the least free. Under normal conditions bismuth is not apt to lodge or remain here to any great extent, and sometimes in scarcely a sufficient quantity to produce an appreciable shadow, and in such instances the mistake is easily made of interpreting the appearance as an indication of obstruction.

Otology

THE INTRACRANIAL COMPLICATIONS OF ACUTE AND CHRONIC SUPPURATIVE OTITIS MEDIA *

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IT gives me great pleasure, gentlemen, to address you on this occasion, on such an important subject. It is probable that in no branch of surgery have such rapid advances been made during the past fifteen years as in the intracranial complications of suppurative disease of the middle ear. You must remember that an intracranial complication may either follow an acute inflammation of the middle ear or may be the result of a long-continued suppuration. The mere fact that a patient gives a history of an acute otitis should never lead you into the error of supposing that simply because the process is acute an intracranial complication may not be present. While this precaution should be observed particularly in the case of young patients, it applies with almost equal force to adults as well. In young children, as you will remember, the roof of the middle cranial fossa is as thin as parchment, and not infrequently dehiscences occur in this region through which a process of dura protrudes. Likewise, the barriers between the mastoid and the lateral sinus and the cerebellar dura are extremely thin, and extension may easily take place in these directions.

You will also bear in mind the anatomical anomaly which is by no means infrequent—that of a jugular bulb where the dome of the jugular presents in the floor of the tympanic cavity, either protected by a thin bony covering, or, in certain cases, absolutely unprotected. It is not strange, therefore, that in early life an acute otitis media should frequently be accompanied by cerebral symp-

* A lecture delivered at the Jefferson Medical College, Philadelphia, March 22, 1909.

toms, and only too frequently attended by actual intracranial infection.

I might spend the entire hour allotted to me in enumerating the various anatomical anomalies, occurring both in infant and adult life, which might well be said to render infections of this kind the rule, rather than the exception. Happily, nature has guarded the intracranial structures more thoroughly than appears from inspection of various specimens.

According to my own statistics at the New York Eye and Ear Infirmary, made some years ago, and extending over a period of eight years, one case in every 88, of middle-ear suppuration, showed some intracranial complication. These statistics are surely appalling. When we consider the comparative frequency with which a suppuration occurs within the tympanic cavity, naturally, they are somewhat misleading, because it is only the severe cases which come under observation at the hospital. They are, however, of importance as impressing upon our minds the great danger of intracranial involvement in every case of suppuration of the middle ear. We may say that, as a rule, the severe intracranial complications follow chronic suppuration within the tympanum more frequently than acute suppuration. But, as before stated, we must always remember that a suppurative process within the tympanum, even of a few days' duration, may possibly be the focus of a purulent infection within the cranial cavity.

The intracranial complications which we have to consider are four in number: (1) sinus thrombosis, (2) a brain abscess, (3) an extradural abscess, and (4) a meningitis.

I have mentioned *sinus thrombosis* first, not because it occurs, perhaps, more frequently than any other of the intracranial complications, but because its symptoms are distinctive, the diagnosis of the condition is fairly easy, and the treatment of the pathological state, if instituted early, promises a favorable outcome.

The distinctive clinical evidence of a sinus thrombosis is a sudden and abrupt rise of temperature to 104°, 105° or 106°, the temperature falling spontaneously in the course of a few hours to nearly the normal standard, only to rise again to its former height after another period of a few hours. It is these marked fluctuations in temperature, occurring in any case of middle-ear suppura-

tion, either after mastoid operation or, in many cases, before surgical interference upon the mastoid has become necessary, which lead the surgeon to suspect a sinus thrombosis. There is no other condition dependent upon middle-ear suppuration which will give rise to these sudden accessions of temperature, with the equally sudden intermissions and remissions, except a septic thrombus in one of the large sinuses; and, as you all know, the lateral sinus is the vessel most often affected. Such a thrombus may not completely occlude the venous channel when the symptoms first appear, and it may exist simply as a parietal clot which, through its breaking down, causes a certain amount of septic material to enter the general circulation. As the successive portions of this clot break down, the systemic circulation is rapidly reinfected or reinoculated with this septic material, and as a result we have the characteristic temperature.

Many other signs and symptoms, more or less confirmatory of the condition, may or may not present themselves; but the one constant, characteristic symptom is the fluctuating temperature. Among the other signs which might be mentioned is the occurrence of rigors. These are present in perhaps rather less than fifty per cent. of the cases of sinus thrombosis. That they are a constant symptom, as so often stated by foreign observers, has not been borne out by a rather extensive clinical experience.

Physical examination of the patient reveals very little. In a certain number of cases there is tenderness extending backward from the mastoid process, along the line of the lateral sinus, this tenderness being fairly well marked over the point of exit of the mastoid emissary vein. In cases which have existed for some time, and occasionally in very early cases, there will be tenderness along the course of the internal jugular in the neck.

The mapping out of a cord-like swelling in the neck, upon which so much stress was laid by the early observers of the condition, has never, in my experience, been present. Frequently the entire neck is tender along the anterior border of the sternomastoid muscle. This tenderness is usually due to enlargement of the deep cervical glands overlying, as you know, the internal jugular, particularly at its upper portion. This glandular enlargement and this tenderness are of great significance as a clinical sign. It sometimes occurs

without any tenderness being present over the mastoid emissary vein, and this is particularly true of those cases where thrombosis of the bulb of the jugular occurs primarily.

The pulse in these cases is usually rapid, the pulse-temperature ratio being hardly changed. It is a significant fact that, in these cases of sinus thrombosis, the sensorium of the patient is usually perfectly free. There is almost never any mental disturbance at all, and the patients complain of very little, excepting that during the febrile stage there may be considerable headache, and when the temperature falls the patients may feel weak and prostrated. Sweating immediately after the high temperature is a rather characteristic symptom. Profuse perspiration is certainly much more frequent in these cases than are rigors. An examination of the fundus oculi will, in a certain number of cases, reveal a choked disc, although this condition is not observed in the majority of cases. It occurs, however, with sufficient frequency to be regarded as of diagnostic importance.

An examination of the blood may yield confirmatory evidence in these cases, but in my experience the differential blood-count may also fail to give any evidence of the condition. I have seen several cases of sinus thrombosis where the septic clot in the sinus has been demonstrated at operation, and where the case has subsequently recovered after ligation of the jugular, in which the differential blood-count gave absolutely no indication of the condition. In some of these cases the polymorphonuclear count did not rise above 80 per cent. and the leucocytosis remained high. In a suspicious case, with an increase of the polymorphonuclears above 80 per cent., the surgeon would naturally be warranted in considering this high polymorphonuclear percentage as indicative of a thrombosis of the sinus. The point which I wish to impress upon your minds, however, is that the absence of a high polymorphonuclear percentage is no indication that the sinus is not the seat of a septic thrombosis.

Quite recently blood cultures have been made in these cases and various pathogenic organisms have been found circulating in the blood, most notably the streptococci. A streptococcaemia, in a suspicious case, is an almost certain evidence of a septic clot within the lateral sinus. Whether or not such a streptococcaemia is always present, we cannot now say. The presence of streptococci in the

blood—or, in fact, of any micro-organism in the blood—would certainly be strong presumptive evidence, in a doubtful case, that there was a thrombus within the lateral sinus. It would be particularly valuable in cases where the pathogenic microbe circulating in the blood was identical with that found in the pus in the aural discharge and from the broken-down mastoid cells.

The treatment of this condition is essentially surgical. The otologist who, in the presence of these symptoms, delays prompt surgical interference is not doing his duty. It is those cases which are operated upon promptly which recover. Those cases which are operated upon late, or not at all, die. Prompt surgical interference must be instituted if these patients are to be saved; and, thanks to the magnificent work done by surgeons in this direction, most of these patients can be saved if surgical interference is instituted as soon as the symptoms manifest themselves.

This surgical interference consists first in an exposure of the lateral sinus, from a point beyond the knee of the sinus to a point just above the jugular bulb. The presence of a clot can usually be demonstrated by palpation, although, if the clot is parietal, palpation may yield negative results. In doubtful cases the procedure of shutting off the circulation first from above, and noting whether the sinus empties itself below the point where the circulation is obstructed, and then shutting off the circulation below, and noting whether the sinus fills above the point of obstruction, constitutes an aid in diagnosis.

In doubtful cases, however, the lateral sinus should be opened by a free incision. The technic of the procedure is as follows: Pressure is applied to the sinus beyond the knee, and the sinus incised just above the bulb. If hemorrhage does not take place from below, a curette should be introduced into the sinus, downward, in the direction of the jugular bulb, so as to remove any clots which may be present in this region. If free hemorrhage from below follows incision, pressure is applied over the incision in the sinus, and the sinus is incised higher up. If free hemorrhage takes place from the direction of the torcular, we are then certain that the lateral sinus is free.

I would deprecate most strongly all efforts at exploring the lateral sinus by the insertion of a needle into the vessel. In many

cases a parietal clot may be present, and the exploring needle will pass completely through this clot, and fluid blood may be evacuated, in spite of the fact that a thrombus is present.

Incision of the lateral sinus is the only procedure which will demonstrate, beyond the question of a doubt, the presence or absence of a clot. If a clot is found in the lateral sinus, it should be thoroughly removed by means of the curette, until free hemorrhage takes place, both from the direction of the torcular and from the direction of the bulb.

The question as to which cases demand excision of the internal jugular vein is still a mooted one. Some authors go so far as to state that a ligature should be placed about the internal jugular vein in the neck, as a primary procedure, and that the sinus should be explored only after the return circulation of the jugular has been shut off by such a ligature. My own statistics prove conclusively that in many cases this procedure is not necessary. In many cases of parietal thrombosis the jugular simply acts as an avenue of transmission for pathogenic micro-organisms. In all cases where free hemorrhage is not obtained from the lower end of the sinus after the use of the curette, and in cases where there is distinct evidence of extension of the thrombus into the internal jugular, as indicated by tenderness along the anterior border of the sternomastoid muscle, together with enlargement of the cervical lymphatics in this region, excision of the internal jugular vein is indicated. In these cases the vein should be excised from a point sufficiently low down in the neck to permit the ligatures to be passed about healthy vein, that is, the ligatures should be placed well below the level of the thrombus. The vein should be divided between two ligatures at a point sufficiently low down in the neck, and should then be excised to a point just below the base of the skull. The trunk common to the lingual and facial veins should be surrounded by two ligatures and divided between them. This is usually the only tributary of the internal jugular which requires ligation. Where interference with the internal jugular vein is indicated, the vein should always be excised and not simply ligated.

The most frequent intracranial complication with which we have to deal, and, luckily, at the same time the most simple, is a localized meningitis or an *extradural abscess*. The favorite site of such an

abscess is in the cerebellar fossa, over the lateral sinus. Next in frequency is the roof of the tympanum.

The symptoms of a localized meningitis are so slight that, in the vast majority of cases, the diagnosis of the condition is not made, and the condition is found only at the time of operation. The manifestations which might lead us to suppose that the patient had an extradural collection of pus would be, first, a moderate temperature, ranging between 101° and 102°; second, persistent, localized headache; third, the persistence of general headache, with the absence of sufficient symptoms in the ear, or in the mastoid region, to account for this symptom. Paretic symptoms are very seldom present in this condition, although, from the peculiar course which the sixth nerve follows, an internal strabismus may occasionally be present. Local tenderness is a sign of considerable value. This tenderness is usually most severe over the site of the purulent collection, and is best elicited by light percussion of the skull.

The differential blood-count aids us but little in arriving at a diagnosis, although a high polymorphonuclear percentage, in the presence of suspicious symptoms, would rather lead the surgeon to think that the purulent collection was not enclosed within firm, bony walls, but was located where a certain amount of absorption might take place. In the very late stages, when the abscess has attained a considerable size, definite paralytic symptoms may be present, although these are very rare.

The treatment of the condition is surgical, and consists in the thorough evacuation of the purulent collection. In operating upon these cases, after the evacuation of the pus, the probe can easily be passed between the skull and the dura for a considerable distance. It is imperative that this overhanging bone be completely removed in order that the entire dural area involved be thoroughly exposed. It is also important, however, that this dural exposure should not extend beyond the line of adhesion which has formed. An extradural abscess is an effort on the part of nature to limit the invasion of the cranial cavity by the purulent infection. To this end, firm adhesions form between the dura and the cranial bones, which completely shut off the abscess from the general cranial cavity. If these adhesions are broken up, there is danger of infection of a fresh area of dura and transmission of this infection from the subdural

space to the arachnoid space, with the development of a leptomeningitis. The operative procedure should then consist, first, in removing the overhanging bone in all directions, so that the area of dural involvement is fairly exposed. The dural area, especially in old cases, will be found to be covered with granulation tissue. Some of these granulations appear healthy, but for the most part they appear unhealthy and necrotic. All necrotic granulation tissue should be removed by the careful use of the curette. To remove every vestige of granulation tissue is, however, I think, a mistake, as this granulation tissue is a barrier thrown out by nature to prevent infection of the arachnoid space. Careful curettage of the exposed dura, then, should be instituted, but great caution should be exercised in order not to perforate the dura by means of the curette, thus causing infection of the arachnoid space. After thorough curettage, the entire cavity is packed with iodoform gauze, and the usual dressing applied.

These cases ordinarily recover. Out of 54 cases upon which I have operated, 48 recovered and 6 died. In most of the fatal cases deep infection had taken place prior to the operation.

The third complication to which I wish to call your attention is that of *brain abscess*. As you well know, a suppuration within the brain substance may follow either an acute or a chronic middle-ear suppuration. Also, the abscess may be of either the acute or chronic variety. By this I mean that we occasionally find that a collection of pus has formed in the brain substance as the result of a previous middle-ear inflammation. The collection of pus becomes encysted, and, from its locality, gives rise to absolutely no symptoms. Then comes a second attack of otitis. The abscess becomes reinfected, and certain symptoms characteristic of the condition develop.

From my own personal statistics, abscesses of otitic origin are more frequently located above the tentorium, usually in the temporo-sphenoidal lobe, the cerebellum being less frequently affected. These statistics also show that infection above the tentorium is about twice as frequent as is infection of the cerebellum. Other authors, however, in the collation of a large number of autopsies, have found that cerebellar abscess occurs more frequently than does cerebral abscess. The discrepancy is probably due to the fact that many of the cerebellar abscesses give rise to no symptoms, and are

simply found upon the post-mortem examination. From a clinical standpoint, however, abscess of the temporosphenoidal lobe is certainly more common than is abscess of the cerebellum, where the primary focus of infection is the tympanic cavity.

The symptoms to which a brain abscess may give rise vary according as the abscess is of the acute or chronic variety. They also vary according to the location of the abscess. We may divide the symptoms, then, into *general symptoms*, that is, those which are characteristic of a collection of pus within the brain, and, second, *localizing symptoms*, which depend upon a collection of pus in some particular locality within the brain.

The general symptoms also vary according as to whether the abscess is acute or chronic. An acute brain abscess gives rise to general symptoms which do not differ materially from those which characterize pus-formation in any other part of the body. We have a moderate febrile movement, ranging from 100° to 102° or 103°, and a rather rapid pulse. From the fact that the abscess is located in the cranial cavity, headache is a very important symptom. This headache is constant, and may be either very severe or of only moderate severity. In cases of long standing, the pain in the head may be dull and not severe, and these patients ordinarily complain of sleeplessness as a prominent symptom. The pulse, in the acute cases, is rapid. After the acute stage has passed away, that is, after the abscess becomes encysted, all febrile symptoms disappear. The brain may accommodate itself to the increased pressure, the headache may disappear, and the patient may pass through what is known as the "latent period." This "latent period" may vary from a few weeks to ten or fifteen years.

When we have to deal with a chronic abscess within the brain, the symptoms are quite different. Headache is present, but instead of an elevation of temperature, the temperature is ordinarily subnormal or, at the highest, seldom goes above 99°. The pulse is ordinarily slow, this slowing of the pulse-rate being one of the most characteristic symptoms of brain abscess. According to the location of the abscess, we have certain symptoms which are fairly characteristic. As before stated, the most frequent site of a purulent collection of pus is in the temporosphenoidal lobe. If the temporosphenoidal lobe upon the left side is involved, we usually have some interference with the speech function. The aphasia, in these cases,

is of a peculiar type. The patients may be able to carry on an ordinary conversation, and seldom be at a loss for a word. If, however, they are asked to name objects shown them they are frequently unable to do this. Either the name of the object will be entirely forgotten, a wrong name will be given, or occasionally they will give the use to which the object is put, but the name of the object itself cannot be given. For instance, if the patient is shown a watch, he may say: "To tell time with"; or, if he is shown a key, he may reply: "To open the door with." He will not, however, associate the word *key* or the word *watch* with the object shown him. If asked if it is a watch, he may say "Yes," or he may be able to repeat the word after the examiner. This form of aphasia is particularly characteristic of temporosphenoidal abscess.

Paretic or paralytic symptoms are not common in these cases, except in the very late stages. The most common paretic symptom is a paralysis of the sixth nerve, leading to an internal strabismus. Motor paralyses of the extremities occasionally occur when the abscess is deeply located so that the purulent collection presses upon the internal capsule.

You must also remember that occasionally an abscess of otitic origin will develop at a considerable distance from the point of infection. In one case I saw an abscess of the left inferior frontal convolution, following aural suppuration, and cases have been reported in which the cortical motor area has been involved. Involvement of these remote areas is, however, comparatively rare.

Vomiting is a symptom which occurs in quite a large proportion of cases—more frequently, however, in those cases where the abscess is located below the tentorium. If the abscess is located below the tentorium, in addition to the vomiting, the headache, and the slow pulse, we ordinarily have disturbance of equilibrium. Certain ocular symptoms may also aid us in cases where the abscess lies in the cerebellum. Of these, nystagmus usually develops when the patient looks strongly towards the affected side, and in this respect it differs from nystagmus dependent upon labyrinthine involvement, where the nystagmus is more pronounced when the patient looks away from the side of the lesion. A persistence of nystagmus toward the affected side, uninfluenced by syringing the ear with cold water, would naturally lead the surgeon to suspect strongly a cerebellar abscess. Examination of the fundus oculi frequently

reveals a choked disc, either in the early or the advanced stages. It should be remembered that these changes in the optic papilla are simply characteristic of increased intracranial pressure, which may occur in cases of brain abscess, sinus thrombosis, epidural abscesses, or general meningitis. The presence, therefore, of a choked disc is simply an indication of some intracranial lesion, and is not indicative of any particular pathological condition.

The treatment of brain abscess consists, first, in thorough eradication of the primary focus of suppuration within the ear. In case of an acute otitis media, the mastoid operation should first be performed. In the case of a chronic purulent otitis media, the radical operation would be the operation of election. The operator should then attempt to find the avenue of infection; he should search carefully for carious areas over the tympanic roof and over the bony wall covering the cerebellum, to ascertain, if possible, through what route the infection has traveled. If the abscess is to be dealt with successfully by surgical measures, it is important that it be drained along the avenue of infection. If this can be done, the danger of secondary meningitis is greatly lessened. If a carious area is found over the tympanic roof, the dura should be exposed in every direction about this locality and the opening in the bone enlarged by removal of enough of the cranial vault, in every direction—preferably upward toward the squama—to permit a free inspection of the dura. The same may be said if an area of infection is found over the cerebellum. When a sufficient area of dura has been exposed to allow proper drainage of the abscess, the dura should be incised and a director passed into the brain substance in various directions. It is to be particularly borne in mind that in making these exploratory punctures, incision of the dura should, if possible, be confined to those areas where the brain coverings have become thoroughly amalgamated by a previous inflammatory process. This amalgamation occurs about the region where the infection first entered the brain. The subdural space will be found completely obliterated in these regions, and, consequently, any purulent collection within the brain substance can be evacuated through these meningeal areas without the danger of setting up a secondary meningitis.

After the abscess has been found, it is my own practice to pass a pair of delicate retractors into the abscess cavity and employ gentle

traction, in order that the entire contents of the abscess cavity may be evacuated. By inspection the operator can then see the abscess cavity. In cases of chronic abscess, we find a cavity with a distinct wall. In cases of acute abscess, this wall is wanting.

The subsequent treatment of these cases will depend upon whether we have to deal with an acute or chronic abscess. If we have to deal with an acute abscess, drainage by means of a small cigarette drain is all that is necessary. To pack such a cavity with gauze is absolutely contraindicated. On the other hand, if the abscess has firm walls its interior should be rather firmly packed with iodoform gauze, so as to stimulate the lining membrane and cause obliteration of the cavity.

While operative procedures upon the brain substance do not yield as brilliant results as might be hoped for, we believe that with improved technic and early intervention the results in this branch of surgery will be better.

The fourth complication, and the one with which, perhaps, it is the most difficult to deal, is that of a *leptomeningitis* of otitic origin. Such a meningitis may be either of the serous or purulent variety. Here, also, the disease may follow either an acute or a chronic middle-ear suppuration.

The symptoms of a meningitis are so pronounced in the majority of cases as to require nothing more than mention. The temperature, as you know, is usually high, uniformly high. The fluctuations of temperature, which are so characteristic of sinus thrombosis, are wanting. In the acute, purulent cases the temperature usually rises rapidly to 104° or 105° , and remains at this level, with slight variations of a degree or a degree and a half. With the high temperature we have at first a rapid pulse, normal respiration, and the patient complains of severe and intense headache. Vomiting is quite a characteristic symptom. The pupils, in the early stages, are usually contracted, but in the later stages are dilated. Inequality of the pupils is very frequently present. At first the contracted pupil is upon the side of infection, but afterwards the pupil upon this side becomes dilated.

Local paralyses are usually absent in the early stages, excepting paralysis of the sixth nerve, which may come on very early.

In cases of a serous meningitis the temperature is ordinarily not as high. The temperature may vary in these cases from 101°

to 103°. General convulsive movements may occur in either the serous or the purulent variety. The state of excitation disappears with a greater or less rapidity in different cases, and is followed by the stage of stupor. The respiration becomes stertorous in the late stages, is of the Cheyne-Stokes variety, and the patient presents symptoms so characteristic that it is not necessary for me to repeat them here.

The treatment of this condition presents one of the most difficult problems with which the otologist has to deal; and yet, from the collation of a large number of cases, one is surprised at the number of instances in which an otitic meningitis is not followed by a fatal termination. In the collation of 100 cases, recently made for me by one of my assistants, nearly half of the cases recovered.

The treatment at the present day is entirely surgical. It consists, first, in the thorough eradication of the primary focus of infection in the way of appropriate operative interference; second, in the relief of intracranial pressure by means of lumbar puncture. These are the first two indications. In cases where the symptoms are extremely urgent, lumbar puncture may not be sufficient to relieve the intracranial pressure. In such cases, the operator is warranted in doing a rapid decompression operation, either over the temporosphenoidal lobe or over the cerebellum, or in both localities, removing a large area of bone and incising the dura. Ventricular drainage may or not may not be instituted. My own preference is to do a decompression operation at first, packing about the margins of the incision in the dura by means of iodoform gauze, and later evacuating the ventricles, if necessary.

From the fact that in a large proportion of these cases infection of the subdural space occurs through the labyrinth, I am at present advocating the drainage of the subdural space in this region, as an early procedure in cases of meningitis. Too little time has elapsed to enable me to give any definite opinion as to the success of this method.

The same may also be said of the treatment of acute otitic meningitis by means of serum therapy. Antistreptococcal serum has been of value, from my own knowledge, in at least one case. The investigations, however, in this direction have not gone far enough to enable us to say just how valuable serum therapy may be.

Neurology

NEUROPATHOLOGY IN CHILDHOOD, WITH A CONSIDERATION OF PATHOLOGICAL FACTORS IN SOME CASES OF RETARDED MENTAL DEVELOPMENT

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NEUROPATHOLOGY in childhood does not differ essentially from that of adult life. We may find that the same pathological processes and the results of such processes upon the structure of the nervous system are approximately the same. The results, however, so far as temporary and permanent disturbance of function are concerned, are somewhat different. This is due in part to the incomplete development of the structure as well as the function of the infantile nervous system.

The central nervous system of the newborn child is only partially complete, and relatively few of the fibre tracts have received their full myelinization; and consequently comparatively few of the higher and more fully developed functions of the brain and spinal cord are active at birth. For this reason the pathological processes which cause relatively minor disturbance in the fully formed adult brain may cause a serious and permanent disturbance or perversion of function when they occur in infancy.

Our knowledge of the various pathological processes is fairly complete; we have a fair, if incomplete, knowledge of the anatomy of the nervous system; but our knowledge of the physiology of the nervous system, on the other hand, is not only incomplete, but is really not sufficient for a good working basis. This is true not only of the action of the nervous system, but also of its interdependent action with the other visceral functions. We have gradually come to understand that not only is the growth, develop-

ment, nutrition, and metabolism of the body dependent upon the nervous system, but that, on the other hand, the development and nutrition of the central nervous system is dependent upon other visceral activity. This has led to a slightly different viewpoint in the study of neuropathology. Even the simpler forms of organic disease of the nervous system require for their elucidation a careful study of the pathological processes and visceral activity elsewhere in the economy. In the report of a case, the study of the nervous system alone is now considered of relatively little value. This must of necessity be the case not only on account of the close relationship of the nervous system to other visceral activity, but because the nervous tissues are exceptionally sensitive in their reaction to infectious and toxic processes. A serious functional disturbance of the nervous system may occur, with relatively little alteration demonstrable, even by the best histologic methods, in the nerve cells. In order to have some clear understanding of such conditions as occur in adult life, it is necessary to study similar processes in the nervous system in infancy and childhood. While this is true in a general sense, it is more particularly so with the wide group of diseases either of primary deficiency of nervous function, or of an abiotic nature (*i.e.*, of an inherent lack of growth power). Among this group may be mentioned muscular dystrophies, periodic paralysis, epilepsy, Huntingdon's chorea, dementia *præcox*, retarded mental development, and some other forms of mental instability.

I have selected for this study the subject of retarded mental development because it presents a varying histological and pathological picture, and because of certain other factors which have been the basis for investigation. The nervous tissues when they are studied in retarded mental development may show gross pathological lesions, or practically no deviation from the normal. In the latter the cells may not show, even with the most delicate methods, any variation from the normal. To understand this latter group would be a distinct advance in the appreciation of other forms of mental disturbance which cannot be explained by anatomical changes.

Three separate lines of study have been followed in an attempt to elucidate the subject—the clinical, embryological, and pathological. While the clinical side has not been altogether barren

of results, it has, on the other hand, given insufficient and unsatisfactory results. The investigations along clinical lines have been mainly directed toward the influence of heredity upon the nervous system. One important fact has resulted. It was at one time assumed that syphilis and alcohol in the parents were the important factors in the production of mental deficiency in the children. An accumulation of statistics of some twelve thousand cases appears to show (taking into consideration the errors and faults of massed institution records) that the important influence is not alcohol or syphilis *per se*, but a condition of lowered nutrition, mainly due to tuberculosis. Correct conclusions cannot, however, be drawn from this information until the effects of associated factors, such as that of transmitted infection, deficient blood tension during development, lowered vital tone, and the effects of the disturbance of various internal secretions on the development, are worked out. An additional factor is that caused by prolonged, difficult, and instrumental delivery. It is well known to the clinician that cases of retarded and deficient mental states are most frequent in the first-born child, and more particularly so when there has been a marked prolongation of the labor period.

While direct traumatism to the children, either through passage through the birth canal or as a result of instrumental delivery, has been most frequently considered the cause of this condition, there are other factors, which will be discussed later, which are of equal, if not greater importance.

The influence of the convulsive disturbances of childhood, while closely related to these factors, does not come within the scope of this paper.

A study of the factors influencing the development of cerebral tissues, and more particularly of the cortical cells, points to a new, and for the most part unexplored field of thought. Czerny, in an experimental and pathological study of the adrenal gland in congenital hydrocephalus, found a defective development of the medulla of the adrenal in his cases. He showed that methylene blue injected into the cerebral ventricles first made its appearance in one of the vessels supplying the adrenal, and came to the conclusion that the adrenal played an important part in the development of the nervous system and more particularly in the production

of internal hydrocephalus. This work has not been supported by subsequent work; neither, on the other hand, has it been disproved. This work is of considerable interest, in view of the recent investigations upon the influence of the pituitary body, thyroid and adrenal glands, testicle, and ovary, on the growth and nutrition of the body, and upon the importance of pathological lesions of these organs in some types of defective and perverted mental states.

In studying the influence of toxic processes on active cells, it should be borne in mind that only when marked and irreparable damage is produced is there any evidence of it shown in the histological picture. It may be considered that the function of the cortical cells at birth is predetermined, but not established; that even temporary disturbance or perversion of function at this time may have serious results later in childhood or in adult life. It is extremely difficult to study the influence of endogenous or exogenous forms of intoxication during prenatal life. A comparative study of disturbed activity of some of the above-mentioned glands, whose functions are to a certain extent interchangeable during infancy and even later, during childhood and adult life, points to a distinct variation of the reaction of the nervous system at these different periods. A study of the thymus, for instance, shows disturbed function in infancy, as is evidenced by thymic asthma and sudden death. In later childhood, in two cases under my own observation, a persistent and enlarged thymus gave rise to an hallucinatory, delusional condition lasting over several days, with reflex dysphagia. In both of these cases hydrophobia was diagnosticated on account of the inability to swallow and the disturbed mental state. In adult life, a grave neuromuscular condition, myasthenia gravis, is associated with, and probably caused by, the pathological changes secondary to a persistent thymus.

Weber, in 1898, called attention to the influence of free blood in the neighborhood of the ganglion cells in the production of iron infiltration. The ganglion cells in the neighborhood of the microscopic hemorrhages gave all the biochemical reactions for haemosiderin. The following year I placed on record a case of the same kind. In both cases the infiltration of the cells with this substance led to a disintegration of the cell. The further study showed that it was an intermediate stage in the process of calcification of the

ganglion cell. A somewhat similar process of an intermediate grade, giving all the biochemical reactions with the microscopic test for haemosiderin, was found in the ganglion cells of the cerebellum of a rabbit which had died from rattlesnake venom with convulsions and cerebellar symptoms. Here there was distinct evidence that an alteration of function, or of functional status, of the nerve cells had taken place. That neuroglia cells act as scavengers has been demonstrated by Bevan Lewis and others. As a result of these changes of function, a sclerotic condition resulted. The future of the ganglion cell is to be one of motor and psychic activity, and where the fixed status is deranged or disturbed by a perversion of the normal function to one of elimination of some foreign substance, and more particularly to one which has been shown to lead to a damage of function and structure of a cell, a serious result in the life history and activity is to be expected. Where the same process is widespread and extensive throughout the cortical tissues, this change in the potential power will necessarily affect not only the individual cells, but the brain function as a whole. Such a condition is found in prolonged and difficult labor, with marked and persistent passive congestion.

I have shown elsewhere that in continued passive congestion in adult life, not only an oedematous condition, with a disturbance of nutrition of the cell, would result from interference with the general circulation, but also an advanced capillary osmosis of red blood-cells obtains. In such cases gross venous hemorrhage is rare; but capillary microscopic leakage is not infrequent. That a similar and more extensive condition may take place in childhood is well shown by the microscopic and gross study of the brain. When a condition of actual injury to the brain takes place as a result of venous thrombosis and gross hemorrhage, the cerebral palsies of childhood, with varying grades of idiocy, imbecility, and epileptic manifestations, occur. In the minor grades of osmotic hemorrhage due to prolonged passive congestion, perversion of function of the ganglion cell results without gross lesion and with less serious objective disturbance. That simple passive congestion in itself leads to serious damage in the life history of the cell I am not prepared to state. The combination of two such important factors as prolonged interference with the cerebral circulation and the perversion

of function and nutrition of the delicate ganglion cells, as a result of free blood in the tissues, could, and I think does, lead to that interference of function and potential which is manifested in later childhood by the failure to advance in mental development beyond a certain stage. There is, indeed, in some of the cases which fall into the above category, no evident loss of power, but a certain clumsiness in the more delicate movements of the extremities, with a tendency to speech disturbance (stammering, stuttering), retarded mental development, and, in some cases, criminal tendencies.

That such conditions (microscopic blood osmosis with iron infiltration) may exist, both in the pre- and postnatal states, is shown in an experimental way in the lower animals and clinically in human beings. It is not the province of this paper to report in detail these experiments, but simply to state that in certain congenital deformities in the lower animals there have been found evidences of previous capillary hemorrhage in intermediate stages of iron infiltration of the nerve cells.

That either inherited or acquired weakness or pathological lesions of the vascular system would necessarily play an important part in the production of the above conditions is evident. The influence of inherited tuberculosis and other dyscrasic states, syphilis, etc., could easily act in this way.

I do not wish to be understood as taking the position that all forms of defective mental states are due to this one pathological cause, but merely to point out one of the factors in a group of cases and to direct attention to a comparative method of investigation of mental states along biochemical lines. Some such method must indeed be adopted if we are to advance in our knowledge of developmental mental states. The correlation of not only the permanent but also the temporary visceral disturbances with minor mental and nervous conditions, and an application of physical chemical means to our present methods of histological and pathological investigation, will be found necessary for proper understanding of many of the mental and nervous conditions of childhood and adult life.

CHRONIC CONSTITUTIONAL HEADACHES

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CERTAIN persons suffer all their lives, or for the greater part of their lives, from headaches for which there appears to be no cause except in the general make-up or constitution of the individual. This constitution or make-up appears to be an inherited one in all or nearly all cases. Indeed, in many, or perhaps most, of these cases the individual has a parent who has suffered in a similar way from headaches, and frequently brothers and sisters also. While some of these patients are neurotic, others do not appear to be so; nor do the headaches often appear to be the expression of an ordinary neurasthenic state.

These headaches are not one-sided and do not exhibit the periodicity and other phenomena which would permit them to be designated as being cases of migraine. Most diligent and careful search fails to reveal any adequate local cause for these headaches. Most of these poor sufferers have gone the rounds of various specialists and have received various forms of treatment directed to the eyes, throat, digestive apparatus, and the sexual organs, often undertaken with hopefulness and enthusiasm by the various physicians consulted.

A study of these cases would seem to indicate that the opinion is widely and generally held by the profession that some local cause *must* be found which, if removed, would result in relief or cure. The truth that these headaches are the expression of a fundamentally faulty constitution seems to be only occasionally recognized; and it is for this reason chiefly that I desire to report several illustrative cases of constitutional headaches. These cases are thoroughly chronic and most resistant to treatment.

It appears to me very sad that these poor sufferers should go about from doctor to doctor, getting various local treatments which are worse than useless, when the only treatment worth the name is neglected, I mean the treatment directed to the whole individual—

physical, mental, social, and religious. Indeed, no treatment at all would be better, far better, than this meddlesome and disappointing local treatment. It is of the greatest possible value to the patient to know the real character of his headaches, to accept them as philosophically as possible, all the while endeavoring with the aid of his physician to lessen them by that which is our best remedy, *right living*.

A careful physical examination, including particular attention to the eyes, should, of course, be made in every case; and the result should be carefully weighed with regard to due sense of proportion. Refractive errors, digestive disturbances, etc., should, of course, be corrected. But, alas, when all this is done, these headaches continue, although sometimes in a somewhat modified character.

Although without adequate proofs to substantiate the view, it appears to me probable that two things are chiefly at fault in these patients: the metabolic processes, and the vaso-motor mechanism.

How frequently constitutional headaches may occur, I cannot state; but I am inclined to believe that they are not very common. They are, in my experience, however, more common than true migraine. The appended cases will serve to illustrate the foregoing views as to constitutional headaches.

CASE I.—A girl, aged 22, single, senior at college. She has never been very strong and states that she has had everything going—measles, scarlet fever, whooping-cough, etc. She is a bright, clever girl and excels at her studies. She has two sisters and one brother, all of whom are subject to headaches, but none is so badly affected as the patient. Her mother, who died about five years ago, was a nervous woman subject to terrible headaches all her life.

The patient has had headaches all her life. She cannot remember when she did not have them. She was never kept awake at night by them. At first the headaches were at the front and back of the head, but latterly they have been very severe over the forehead, where there seems to be pressure from within outward. The headache is never one-sided, but it may be worse on one side than on the other. She remarks that "I must be doing something every minute or I will know that my head is aching." Nothing relieves

the headaches. She states that imagination runs riot with her, that things seem to her just as in a dream. After a day of severe headache she is very nervous the next day.

All last summer she refrained from reading, and the headaches were just as bad as ever.

The patient's menses began at the age of 12 and they have been regular and normal in character. Her appetite is good; her bowels are constipated; she weighs 125 pounds. She averages eight hours' sleep at night. She is nervous and ready to get up at six o'clock in the morning. She does not feel tired. She has many bad dreams and states that she is the "biggest coward going." She is afraid of pain and afraid of the dark. She has periods when she is sad; but she does not readily fall into tears. She is happy in her school life. She plays tennis a good deal. Her eyes have been refracted by a very competent oculist, who is well informed as to the headaches. He has given her glasses for constant wear and also additional glasses for reading. These glasses have been corrected from time to time.

To me on my several examinations the patient appeared as a bright and happy girl with good temperament and sunny disposition. I noted some of the fears to which the patient refers. She has a great fear of the static electric machine; she jerks and resists tapping of the patella tendons. She tells me that she cannot control expressions of pain. The patient's color is good and her tongue is clean.

I saw this patient from time to time and advised her as to her mode of life, etc.; but she appeared to make no improvement. I then wrote to her father as follows:

"I have seen your daughter at intervals of three times a week. Her headaches arise, I believe, from a faulty make-up of her body, by which her various functions fail of exact proper performance. She has what we doctors term a neuropathic temperament—that is, a temperament with a proneness, unduly emphasized, for developing various morbid nervous manifestations. While she comes for the relief of the headache, and at first spoke only of that, cross-examination develops that she is at fault in other directions. She is unduly sensitive, possesses morbid fears, is generally high-strung,

and is prone to react unduly to various stimulations, mental and physical. A very discouraging feature in her case is the long existence of these headaches, and the fact that her mother before her suffered from them. A part of her defective make-up is seen in her eyes, which are badly at fault. Unfortunately careful correction of this defect by glasses does not relieve her of the headaches. But, on the other hand, I am quite satisfied that the headaches would be much worse without the glasses. In other words, the headaches, in my opinion, are in part caused by a refractive error of the eyes. But, on the other hand, I feel quite convinced that the eyes are not the sole cause of the headaches. The eyes have been carefully corrected by Dr. Culver; and they should be gone over from time to time, so that your daughter may have the benefit of all that can possibly be had in this direction.

“These headaches, then, in my opinion, are an expression of a faulty make-up and temperament of the girl. They dominate, as we doctors say, the clinical picture, being by far the most conspicuous expression of a neurotic temperament. I consider that your daughter is over-bred and over-educated. Many of the most talented people in the world—great writers, artists, and so on—have suffered much as she does. For example, George Eliot suffered from such headaches all her life.

“I regret that I must reach the conclusion that your daughter’s headaches are well-nigh incurable. Yet, holding this view, I do not feel that we should give up the effort to help the patient. Often we can get relief which stops short of cure; and this is as much as I am hoping for in her case. Although there is a tendency to outgrow such headaches as years go on, nevertheless this prospect for your daughter, a young girl, is somewhat remote.

“I believe that a free outdoor life with regular duties and no studies, and attention to all the details of hygiene, offers, with corrected vision, the best prospect of relief. I think there can be no doubt that close application to studies, with the rivalries and desires to excel which belong to school-girls, and which are especially seen in such high-spirited girls as your daughter, is well calculated to make the headaches worse than they would be otherwise.

“I have talked these matters over frankly and carefully with

your daughter, and I think she understands my views of her case quite thoroughly. Now, shall she stop school at once? I hardly like to take the sole responsibility of answering that question. It might be that taking her away from school now would fret her and worry her so that she would not be benefited. I must ask your judgment in the matter, and ask you to share the responsibility of action. Certainly, if she does not leave school now, she ought to do so at the end of the term and arrange to live such a simple life as I have outlined. I have suggested to her that the care of young children would offer her a regular occupation, take her outdoors, and produce normal healthy tire. She could pursue this work without looking at books. Something else may suggest itself to your mind; but I do not believe it would be well for her to lead a *dilettante* life. She would be dissatisfied and unhappy, I am sure.

"Now as to the present. I am trying to relieve the headaches with certain remedies; but as yet with no success. I shall continue my efforts, and I hope to be able to afford some measure of relief presently. At the same time it might be best to cut off some of her mental work, so that some of the pressure that is back of it could be subtracted."

The foregoing letter and another following the next case reported are given in full because they state pretty fully my own attitude as regards the treatment of patients suffering from these constitutional headaches; and I need not, therefore, go into the matter of treatment in the subsequent cases to be related. Unfortunately it does not very often happen that one physician is permitted to follow up for a period of years one of these patients and have his directions in all respects faithfully carried out. And, indeed, it must be confessed that there are many difficulties in the way of carrying out the treatment, which must intimately affect the life of the patient and be continued for many years.

CASE II.—Man, aged 37; married eleven years; florist; drinks a little occasionally (two drinks a week); heavy but slow smoker (seven to ten stogies a day). He had lues fifteen years ago and took medicine six or seven months; no secondaries. His family is long-lived; no nervousness in family. He has only one brother.

The only severe disease he has had was typhoid fever, five years ago. He has been subject to headaches all his life, ever since he can remember, but the headaches have, he states, changed in character during the last ten years. Previously they were occasional and would terminate in and be relieved by vomiting. But during the last ten years they have been continuous and vomiting has been much less frequent.

He has taken many powders of various kinds and has consulted about thirty doctors, every one of whom he states was on the search for local causes and several of whom were confident they had found them. The source of the headache was located in the head, the ear, the tonsils, the stomach, the bowels, etc. He has for a long time taken on an average two headache powders a day and he now states he intends to take morphine, although knowing the consequences of so doing.

His eyes were examined by a competent oculist three years ago and pronounced all but perfect and no glasses were prescribed.

The headaches are generally, almost wholly, frontal in location. He pointed to a spot in the middle of the forehead as being the seat of the pain. The headache is not now, and never has been, one-sided. Now he is apt to have headache after he has had a day practically free from them. At the present he has headache about four days in a week. He cannot figure out that eating bears any relation. He has no distress after eating, no painful spots. He sleeps well and is rather a light eater; his bowels are constipated.

During the headache he does not especially seek a dark place, but he desires to be left alone and is disinclined to hold conversation. Occasionally he lays off half a day on account of headache, but not often.

The patient is a quick, active, alert man, evidently very bright in a business way. He was agent for a pork packing company in Chicago which required him to travel a great deal and which involved great responsibility. He married a girl in —, settled there eleven years ago, bought out a greenhouse, and made a "go" of this business although it was entirely new to him. Four years ago he leased the greenhouse to a concern for three years, thinking he would take it easy and just do nothing for a while. He went down town to the Club and found the men there too lazy to play

billiards and too careless to play whist well, and their gossip became intolerable. Idling became a great drag; so at the end of three weeks he sought a position with the pork packing company and went to work with characteristic energy and again made a success of it; but his position involved much traveling and considerable responsibility. One year ago the greenhouse came back to him again and he once more tried to make it go. But as the business depression and other causes prevented him from doing very well the business became distasteful to him.

Physical examination revealed nothing remarkable. Pupils, knee-jerks, etc., normal. The patient is of a nervous temperament, quick and active, intelligent and alert. I wrote the following letter to his physician:

“I regard Mr. ——’s headaches as constitutional in character and as practically incurable by any means that can be adopted. But when I say ‘incurable’ I do not mean to say that he cannot be helped, for I think he can if he does not expect too much.

“The patient has been subject to these headaches ever since he can remember. He is of a nervous make-up, active and alert; but somehow there is disharmony in the relation of his parts, probably metabolism is in its intimate processes imperfectly performed, and there is a morbid reaction which results from time to time in a crisis—a headache. These headaches are a part of the very expression of this man’s life. I feel convinced that the cause for them cannot be found in any organ of his body. My physical examination revealed practically nothing; and even if I had found something here, there, or the other place, I would have felt like going very slowly in drawing the conclusion that these were the causes of the headache. But I do believe that every effort should be made in righting anything that may be wrong. And knowing, as we do, that eye-strain is one of the greatest causes of headaches, I would have the eyes gone over again by one of our best oculists; and I would like to have a report of his findings. But I do not believe he will have complete relief from glasses even should a refractive error be found.

“By way of treatment, I think that after we have eliminated or adjusted the eyes, we should give our attention to the whole

man. I advised Mr. —— that whatever else was done for him he could feel sure that by hygienic living (both mental and physical) he would be making no mistake. I mean that he ought to get full hours of sleep, a daily sponge or plunge bath with brisk rub; I believe he should work and should play. When the headaches are very severe it would probably be better for him to lie down. It is of great importance that his bowels be kept open regularly and I think cascara sagrada is probably our best remedy for this purpose. But I would encourage him to use large quantities of fruit and oatmeal for breakfast and to exercise physically with a view of overcoming his constipation. Horseback riding ought to be good for him, but I think working in the greenhouse would also do him good. If possible he should have a fad such as photography, tenpins, etc. I think he ought to have two or three vacations a year, and every now and then a rest cure or semi-rest cure would be very desirable for him. I have warned him that headache remedies are only props. As he has taken them so long, I dare say he will continue to take them; but I have warned him especially that he must not take opium at any time. And for yourself, I would suggest the simpler the remedy, the better for him. If he can be relieved by bromides and citrate of potash let him have them.

“Finally I suggested that if he could stay in the hospital for a couple of weeks I could examine his blood, urine, etc., and study him day by day and report to you later. Or else I suggested sending him for observation and semi-rest treatment to Dr. ——, whom I know to be a capable man and whose Sanitarium is well conducted. I warned him against fads and fakirs and advised that, if he wanted any further counsel, if he would let us know we could name a man to go to better than he could find one for himself.

“I told him I expected his headaches would continue no matter what he did; but I thought they could be relieved in two ways: (1) by remedies to help them; (2) by his own mental attitude towards them—*i.e.*, by discounting them. By this latter expression I mean that if he would try to minimize them he would help things along. I told him if he led a right kind of life I thought he might get a great deal of comfort now and more in years to come and his headaches might ultimately disappear altogether.”

CASE III.—An unmarried woman, aged 26 years. Her menses began at 12 years of age. The patient has had headaches all her life; she cannot remember when she did not have them. As a rule, her headaches are not localized, but are diffused over the head; but occasionally they are more or less localized over the forehead. Occasionally she has suffered a streak of pain over the top of the head running from before backward. She states that the top of her head beats. Her headaches during the last five years have changed in character. Previous to that time she states that she had sick headaches; now they are not of that character. She cannot read without glasses. She is sure to have headache if she were to attempt to do so. She often reads (with her glasses) a whole afternoon when suffering from headaches, and under these circumstances can lose herself in a book. Her headaches are not of daily occurrence.

Her mother suffered from headache all her life; and all the members of her family have headaches and are nervous.

The patient's monthly periods are painful, lasting for about one week. She sleeps very well and can sleep at any time. Her appetite is good; bowels are regular. She has sensations of beating or jumping all over her body. She is herself not fidgety; but she is easily startled. She suffers much from rush of blood to the face. She considers that she was always of a nervous temperament. She went to school up to the age of 18, graduating from a preparatory school and attending college for one year. She stopped school on account of her eyes.

Her eyes have frequently been examined by oculists. When she was 18 years old she was given glasses for reading. She was examined last winter by Dr. Wilner of Washington, who did not change her glasses.

The patient is of good appearance, good color. Her weight is 137 pounds. A physical examination was practically negative. She suffers from no tender spots and does not appear especially nervous.

It occurred to me that in this patient's case there was probably some considerable disturbance of the vasomotor tone. Besides the usual hygienic directions I prescribed for her a mixture of bromide of potash, tincture of belladonna, and tincture of gelsemium. The

patient reported a little later that she was much relieved of her headaches, but I observed her for too short a time to state whether the treatment had had any permanent effect or not.

Only recently, twenty months after I saw the patient, I received from her the following note:

"While I still have very severe headaches, they are not so frequent as they were at the time I came to you. Sometimes I am free from headache for a month or perhaps longer. But when I do have it, it is very severe. You helped me break off from the bromo-seltzer habit so easily that I can never tell you how grateful I am. I assure you I appreciate, more than I can say, what you have done for me."

CASE IV.—A man aged 30, a druggist, married seven years. As a child he had all the diseases going. For the past thirteen years he has been well except for his headaches. He has had bitemporal headaches ever since he can remember anything. His mother, now 56 years of age, has suffered all her life from headaches; they begin in the back of her head and go up over the head from the temples.

The patient's habits have been good, and he has not taken headache remedies very much. He has worked very hard at his business. His eyes have been carefully examined on several occasions by Dr. Heckel, once very recently. He wears glasses constantly, having astigmatism. He states that if he leaves off his glasses he suffers from headache which is largely in the eyes, and different from his usual headaches.

The patient has headache all day and every day, but some days it is more severe than others. He can never predict the coming or termination of a severe attack. He does not observe that the headache is any better when he is out of doors. He goes to sleep with it and wakes up in the morning with it. It never terminates with vomiting. He can eat quite as well when the headache is severe as when it is mild. When his headache is worst he says he works hard to forget it.

The patient feels tired and dragged out in the morning. He is a night owl and does not wish to go to bed even at midnight. He sleeps very soundly and even the telephone does not waken him. During the period of the headache he is pale, never flushed. When

the headache is most severe he wants no remedy except to be left alone. He does not appear to avoid light unless he has a long run of headache. Diversion, such as is gained by going to a dance, can make him forget his headache.

Dr. E. B. Heckel examined the eyes and reported:

"R.V. = 20/70; 20/15 w. + 0.75 D.S. ~~□~~ + 1.00 D.C., ax. 90°.
"L.V. = 20/50; 20/15 w. + 0.75 D.S. ~~□~~ + 0.75 D.C., ax. 90°.

"I ordered glasses for him at that time within one-fourth dioptre of full correction.

CASE V.—A woman aged 28 years; married seven years; one child four years old. She has suffered from headaches since her earliest recollection up to the present time, the character of which she does not define very clearly. She has two or three attacks every month, each lasting from half a day to three days; and they are always so severe that she is confined to bed in consequence of them. Sometimes the headache is chiefly frontal, less frequently it is chiefly occipital; in many attacks it is diffuse and cannot be localized. The pain is never one-sided. She does not vomit in attacks except on occasions when she has taken morphine.

Her general health has been, between the attacks, good. But she is now complaining of morning tire and some morbid fears. Her appetite is fairly good; her bowels are kept open by laxatives. The patient cannot relate the headache to anything she does, except that she notes that sewing is apt to bring it on. Reading, she thinks, has no effect. Headache occurs with equal frequency whether she is quietly at home or actively moving about.

Last October, both ovaries were removed by a surgeon; since then the headaches have been rather worse than better. Previously she menstruated regularly but scantily; no menses since operation.

Several years ago a competent oculist fitted her eyes with glasses and subsequently another first-rate oculist prescribed glasses for constant wear, which she used for one year. She could note no benefit from the glasses. Vision in right eye is 20/30; in left 20/30 also.

Examination.—Patient has a good color; she weighs 136 pounds. Physical examination is negative. She is rather cheerful in disposition and does not seem morbid. Lately the attacks have seemed

more severe than usual. She never goes as long as two weeks without an attack. She does not require that the room be darkened in an attack, but she must lie down.

There is no history of headaches in the family.

CASE VI.—The case of a woman aged 30 who has been married five years. She has but one child, a baby thirteen months old; no miscarriages.

Her father, who is dead, had been a great sufferer from headaches all his life, and at times was confined to bed for days at a time in consequence of them.

While the patient has never been in robust health, she has never suffered from any serious illness except once when she had an attack of typhoid fever two years ago. Her menses are regular.

She states, "I have had headaches all my life." Her eyes were refracted by one of our most careful oculists a few months ago; she thinks that the headaches have been worse since she has worn these particular glasses. Lately she has been confined to bed about one day a week on account of headaches. Her headaches are constant and diffuse, but more especially located in the occiput; they never have been one-sided. She is subject to great exacerbations of headache, but light does not aggravate it, and she believes that reading does not make the headaches worse.

She is apparently not especially nervous; but headaches are made worse by excitement or by petty annoyances. She weighs only 99 pounds, is thin, pale, and under-developed. Physical examination discovered no definite disease. She sleeps well and upon awakening in the morning she does not feel tired. She has more or less pain in the back. Her bowels are constipated and her appetite is whimsical.

Examination of the blood was made by Dr. George Wright, who reports as follows: Hæmoglobin, 75 per cent.; red cells, 3,480,000; white cells, 6800. On the basis of Dr. Wright's report and the appearance of the patient, iron and arsenic were advised.

A letter from the family received about eighteen months after the examination contained the following report:

"She seems much better now, built up in flesh, but still suffers somewhat from headaches, although not so intensely or so frequently."

Ophthalmology

INTERSTITIAL KERATITIS *

BY ISAAC LEDERMAN, A.B., M.D.

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THE patient before us is a girl thirteen years of age. It will be noted she is suffering from an extensive interstitial keratitis involving both eyes. The history is that the disease began with a gradual onset, haziness of the cornea of one eye, which spread gradually over the entire area of the cornea. The other eye soon became similarly involved.

I need only recall some of the classical symptoms of interstitial keratitis. You will remember that it is a disease involving the deeper layers of the cornea, that it is due to inherited syphilis in the larger majority of instances. Certainly this case is a typical representative of the type of inherited syphilis as manifested by interstitial keratitis. The notched teeth which this child has are very often noted in cases of inherited syphilis.

Usually the time at which interstitial keratitis, when due to inherited syphilis, manifests itself is in early childhood, the average time being from eight to twelve years of age, the limits being five years on the one hand and eighteen to twenty years on the other. This limit, however, is not absolute, and we may see the disease earlier, developing in younger children, or its manifestations may not appear until adult life.

As you are aware, interstitial keratitis is not a surface lesion; it involves the interstitial structures of the cornea. It usually begins at one margin of the cornea and then spreads in every direction until it covers this entire region. In the mild or favorable cases the lesion soon begins to clear. The healing process starts

* Clinical lecture delivered at the University of Louisville Medical Department.

at the part of the cornea first involved, and may make its appearance before the inflammation has advanced over the entire cornea. There are also limited cases in which the entire cornea is not affected, where the lesion will begin at the margin of the cornea and extend only a slight distance toward the centre, then gradually be absorbed. Again, we have the severe cases in which the lesion will rapidly extend over the entire area of the cornea, in which the entire cornea becomes opaque, resembling ground glass in appearance. There is almost always a certain amount of pannus in these cases; the blood-vessels are inclined to creep over from the margin of the conjunctiva, forming a web or mesh of vessels on the surface of the cornea.

Interstitial keratitis begins, as a rule, first in one eye, then the disease runs the course just indicated. Three or four weeks later the other eye becomes involved, and the same course is pursued, irrespective of what may be the condition of the eye first affected. Thus in the course of six weeks both eyes are involved, and very often if we do not see the case before that time we may not be able to decide which eye was the first one to become affected. The disease usually reaches its acme in about six weeks, then remains for an indefinite time, finally passing to the stage of absorption. The usual duration in mild cases is three to six months; in severe cases it may last a year and a half to two years before absorption finally takes place.

During the time of the active stage of the disease, the so-called inflammatory stage, the first six weeks to three months, the eye is subject to several complications, and especially is iritis likely to occur. Iritis and cyclitis are not infrequent complications of interstitial keratitis, with the subsequent destructive action of these diseases, such as minus tension, secondary choroiditis, floating bodies in the vitreous, and degeneration of the eye from interference with nutrition. These are the principal complications that we fear. The cornea in mild cases will eventually clear up and as far as one can tell return absolutely to its normal appearance. This favorable result, however, cannot be expected in the average case. Even the average case will leave a certain amount of opacity of the corneal structure and consequent diminution of vision. Interference with useful vision depends in its degree entirely upon

the location, extent, and density of the corneal opacity which is left.

This girl has had a severe case of interstitial keratitis which has existed for nearly a year; it has run the usual course; she has had the customary ups and downs. This is a peculiar feature of the disease, for it will get better and the patient will apparently be on the high-road to recovery when suddenly there will occur a relapse, which may happen at any time during the course of the disease. Another peculiar feature is that when the disease has once run its entire course, when the patient has gotten well, it is very rare that a relapse occurs. When we speak of a relapse, of course, we mean a recurrence of the inflammatory symptoms which occur during the natural history of the disease.

The subjective symptoms of interstitial keratitis are: (1) pain, although this may never be a prominent concomitant symptom; (2) interference with vision; (3) lachrymation; (4) photophobia. This history is followed out in almost every instance irrespective of, or rather uninfluenced by, any method of treatment.

Our treatment in these cases is directed toward controlling or preventing the complications which we fear may take place, viz., iritis, secondary involvement of the structures within the eye, etc.; and by treatment we always hope that we may shorten the duration of the disease. I believe our treatment does much toward saving the corneal structure from becoming permanently involved in the dense opacities which may remain. To judge from appearances alone the case at times may seem hopeless, but we are always led to believe from experience, in the majority of cases at least, that the eyes will improve. In the majority of instances the prognosis is better than it would seem when the disease is at its worst, and it is often surprising to note that after a year or two the eyes present a nearly normal appearance and the patient has useful vision.

The treatment of interstitial keratitis is essentially that of syphilis, although we do not treat the hereditary cases with quite as much activity as we do primary syphilitic cases. Mercury, iodide of potassium, and iron are the three drugs upon which we depend in this class of cases. Mercury may be given in any form which our individual choice may dictate, the protoiodide, calomel, or the gray powder. The iodides may be administered as iodide

of potassium, or the iodide of soda, in small doses. Five drops of the saturated solution of potassium iodide three times a day is sufficient. We do not accomplish anything by large doses of these drugs in interstitial keratitis as may be done in acute lesions of acquired syphilis. Iron is an important remedy in these cases. Cod-liver oil is also indicated. Of course the hygienic condition of the patient should receive attention. As much exercise out of doors as consistent should be prescribed, and the diet should be nutritious and plentiful. These particulars are important, for it is necessary to raise the general standard of health of the patient during the time when the disease is running its course.

The treatment which we apply locally must be in the main palliative. One depends principally upon heat to relieve the local symptoms; heat also has a relaxing effect on the blood-vessels and this tends to control the reaction. Atropine is a very important drug in this disease. We use it constantly during the entire course unless glaucoma, which is a very unusual occurrence, supervenes. The idea of the continual use of atropine in these cases is so to affect the iris as to prevent the development of iritis. If iritis has already developed before we see the patient, the indication for atropine is even more pressing. We begin the use of atropine at once to keep the pupil dilated in order to prevent iritis.

There is a drug that has gained prominence recently which is supposed to stimulate the lymphatic system of the eye, to flush the lymphatics as well as blood-vessels. This drug is called dionin; it is akin to morphine, being a synthetical compound. It has been used during the last few years quite extensively to promote the absorption of exudates about the eye. It has been used in interstitial keratitis, in iritis, and other lesions of the eye in which an exudate is present. When this drug is applied to the eye, the usual strength being a 5 to 10 per cent. solution, the first effect is irritation, the blood-vessels become suffused; in a few minutes the conjunctiva will become raised around the cornea, causing a condition known as chemosis where there is oedema of the conjunctiva around the corneal limbus. This will last for a variable length of time, from ten minutes to half an hour, and the first sensation complained of by the patient is that of a foreign body in the eye. Later a certain analgesic or anodyne effect makes its appearance.

Hot applications are ordinarily used at the same time. Some observers claim to have secured excellent results from this drug. Personally, I have not seen any very decided results in interstitial keratitis. The instances in which I have seen the most satisfactory results following its use have been in iritis, and then the drug was combined with atropine. In iritis we find that dionin will frequently control the pain and will very materially enhance the effect of atropine. In keratitis I have not seen any very decided effect in the way of clearing up of the cornea. I consider it our duty, however, to recommend the drug in these cases because of the favorable reports received from those who have employed it for some time.

Dionin very soon loses its effect, and one can always gauge the strength of solution to be used by the reaction which it causes. For instance, if we start a patient on a solution of dionin of a certain strength, we will find in the course of three or four days that the reaction, *i.e.*, suffusion of the blood-vessels and swelling of the conjunctiva, will gradually decrease, and after a week or ten days there will be no reaction whatever. If the drug is discontinued and the eye is given a rest for a few days a second course of treatment will be attended with exactly the same results as the first, and the eye will again react readily to the use of the drug.

After the acute inflammatory symptoms have subsided these patients are put on a stimulating ointment, such as the yellow oxide of mercury (2 per cent.), which is applied to the eye twice a day and is combined with massage through the lid, the object being to stimulate absorption of the exudate that remains on the cornea. Frequently this treatment will be found quite irritating to the eye, especially if started too soon, and we have to discontinue it, resuming the mercurial ointment after all inflammatory symptoms have subsided. It is sometimes necessary to use the yellow oxide of mercury ointment and massage for many months before any appreciable beneficial effect is attained.

Another procedure is sometimes used in this class of cases, namely, the injection of certain solutions under the conjunctiva. Subconjunctival injections gained considerable prominence a few years ago in the treatment of all manner of diseases of the eye, such as corneal lesions, iritis, internal eye disease, choroiditis, detach-

ment of the retina, etc., the principle involved being the same as that mentioned in connection with the action of dionin, namely, flushing of the lymphatics. The character of solution used does not seem to make very much difference, as there does not appear to be any greater effect from one solution than from another. Consequently it has been claimed that the action of these subconjunctival injections is purely mechanical. The solutions which have been used are principally normal saline solution, and solution of cyanide of mercury, the cyanide being less irritating than the bichloride. It is claimed further that some alterative effect of the mercury is obtained by injecting it in this manner. I believe that just as good effects may be procured from saline solution or even sterile water. I would, however, prefer the isotonic saline solution. The procedure is usually somewhat painful, but by preceding its application with cocaine patients will bear the treatment very well. These injections are made at infrequent intervals, one a week, or even one in two weeks being sufficient; and some very good results have been seen after the use of subconjunctival injections.

In making subconjunctival injections no special instrument is required, for we may use an ordinary hypodermic needle. After the cocaine has exerted its effect in anæsthetizing the conjunctiva a few drops of saline solution are injected under the conjunctiva at several points around the cornea. There is no particular point at which the injection should be made, and it is only necessary to make a circle around the cornea, taking care not to deposit too much of the solution in any one place. I make several punctures, depositing a drop or two of the solution at each point until the cornea is entirely encircled. Of course care must be exercised not to puncture the sclera at any point. To avoid this we hold the needle in a rather horizontal position, of course being careful not to touch the cornea. The local manifestation following subconjunctival injection is of no particular consequence, except that lachrymation is slightly increased. It is uncertain just how much good can be accomplished by this means of treatment, but it may be possible to hasten absorption of the exudate, and in any event the method seems worthy of trial.

Pathology

EXOTIC DYSENTERIES

BY PAUL G. WOOLLEY, M.D.

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THE development of intimate relations with tropical and semi-tropical countries has undoubtedly increased, and will continue to increase, our American intestinal flora. It is well, therefore, for us in America to acquaint ourselves with the tropical forms of disease in order that we may be able to recognize and cope with them. After all, the study of forms of disease that occur outside of our own country has the benefit of adding perspective to our studies of local disease, and this in itself, should we never come in contact with exotic forms, is a sufficient reason for acquiring some knowledge of them.

In the following pages I wish to take up some forms of primary and symptomatic dysenteries (excluding those called catarrhal) that are associated with tropical climates, or which are more common in tropical and subtropical regions. The ones that I shall discuss are bacillary or epidemic dysentery, intestinal amoebiasis, known also as amoebic or tropical dysentery, and certain other diseases with which mucosanguineous diarrhoea or dysentery is associated—notably those caused by the animal parasites *Opisthorcus sinensis*, *Paragonimus westermanni*, *Fasciolopsis buski*, *Schistosoma haematosobium* and *japonicum*, and finally those associated with *Trichomonas intestinalis* and *Balantidium coli*.

BACILLARY DYSENTERY

Bacillary dysentery is an infectious disease localized in the intestine and caused by *Bacillus dysenteriae*, an organism belonging to the colon-typhoid group.

Bacillus dysenteriae was first isolated and studied by Shiga in Japan. Since his discovery identical and similar organisms have been found associated with dysenteries in many other parts of the world. The various strains, though very similar to one another, differ in their abilities to ferment sugars and in the specificity of their agglutinins. It seems to be true that Shiga's organism, which is able to ferment dextrose only, and which does not produce indol, is more virulent than the types of Park and Hiss, Flexner, Strong, or Harris and Wollstein, all of which produce indol and ferment other sugars than dextrose, notably mannite.

Bacillary dysentery is *par excellence* a disease of armies and of institutions, and is a result of carelessness in matters of hygiene. In the days following the occupation of Manila it was common. In those times the sanitary affairs of Manila were in a bad way. The water supply was bad and the methods of sewage disposal were the crudest at best. As the sanitary arrangements have been improved, bacillary dysentery has practically disappeared.

At least as important as public hygiene in the control of this disease is personal hygiene. Shiga¹ says that the most important source of infection is the individual suffering from dysentery. In the stools of such persons the organisms are present in enormous numbers and can be carried from person to person on the hands, clothes or utensils of various kinds. As important as the patient suffering from the disease is the person who has recovered but who still carries the bacilli in his intestinal tract.² We are learning more and more about these "carriers" as time goes on. In such persons lies the danger of establishing new foci of infection. Shiga says, in this connection, that Ohno found the bacillus in the stools of apparently healthy men living near a household in which there was an epidemic of winter diarrhoea. Wollstein, Conradi, and others have reported similar instances of the danger of "carriers." Such cases remind us of the danger of returning soldiers and of other persons who have sojourned for some time in tropical regions and who have perchance suffered while there from diarrhoea or dysentery.

This form of dysentery is, as I have said, localized in the bowel, from which the organism does not, as in typhoid fever, enter the circulation. In the bowel the process is a severe inflammation restricted, as a rule, to the large bowel but sometimes extending

into the ileum. The type of inflammation may be catarrhal, hemorrhagic, or diphtheroid. In severe cases the latter is predominant, and this with ulceration and necrosis leads to profound changes in all the coats of the gut. Perforation is rare, though comparatively benign; localized peritoneal changes frequently occur and end in the formation of adhesions. The intestinal lymphoid tissue and the mesenteric glands are swollen, and the liver and kidneys often show parenchymatous changes, usually of a mild grade.

The symptoms of bacillary dysentery parallel the pathological changes in the intestine. In the early stages the symptoms are those of an acute catarrhal enteritis. More severe symptoms rapidly develop; pain and tenesmus appear; and the stools become more frequent and are mucoid and finally mucosanguineous in character. The material passed at stool often contains no fecal substance but is composed only of small amounts of mucus and blood. If necrotic processes are severe, the stools become purulent and contain shreds of membranes or gangrenous material derived from the walls of the bowel. Tenesmus is extreme. The temperature varies from normal in very mild cases to 104° or higher in severe ones. The pulse is quick and often irregular. The urine is diminished. Weakness, headache, restlessness, and delirium testify to a toxæmia resulting from the action of the endotoxin of the bacilli. Nausea and vomiting occur but are not as extreme as in cholera. Moreover the symptoms vary with the localization of the processes. In cases in which the lesions are low in the bowel tenesmus is more marked; in those in which the lesions are high, tenesmus is not marked or is entirely absent, and the symptoms are those of a general intoxication. In mild cases recovery is rapid. In severe ones the course may be very tedious. Relapses are frequent.

Complications are not frequent. Shiga has reported eight cases of parotitis in 436 sufferers. Localized peritonitis is, as we have said, not uncommon; general peritonitis is rare. Rare complications are acute conjunctivitis, iridocyclitis, and prostatitis.

The diagnosis is not difficult in times of epidemics. In sporadic cases recourse must be had to laboratory methods, for in such cases the diagnosis depends upon the isolation of the organisms from the stools, and upon specific serum reactions.

Prognosis depends upon the extent of the lesions, their localization, and the age and resistance of the patient. In children and old people the prognosis is bad, and the same is true if the lesions are high in the bowel, and especially if they extend into the ileum.

Treatment is, so far as drugs are concerned, symptomatic. Absolute rest and quiet are necessary. At the onset of the symptoms a dose of calomel is useful. Ice-water enemas are comforting to the bowel. The serum treatment has given good results in the practices of certain writers, notably Shiga,² Vaillard and Dopter,³ Vidal, and others. The polyvalent sera seem to be the most useful, reducing the mortality, lessening the severity, and shortening the course.

Prophylaxis can best be accomplished by care in the matters of personal and public hygiene. When more than this is desired, especially in times of epidemic, the serum may be used to confer temporary immunity. The serum is generally administered hypodermically, though Dopter has recently reported⁴ some success in establishing immunity by feeding killed (60° C.) and desiccated cultures. The immunity is said to last for thirty days in mice.

INTESTINAL AMOEBAIASIS

Intestinal amoebiasis, though commonly called amoebic dysentery, is not necessarily characterized by dysenteric symptoms, except perhaps in the late stages. The severe symptoms often appear only after the onset of secondary infections. I have seen cases which, while they harbored amoebæ for months, showed no symptoms of dysentery until within a few weeks or days of death. The intestines of such cases very often showed at autopsy widespread amoebic ulcerations of all types but with superimposed acute fibrinous enteritis, which is not a feature of uncomplicated amoebiasis. On the other hand some cases are dysenteric from the clinical onset, though even in such cases it is probable that the acute symptoms which called attention to the condition did not coincide with early infection. As a matter of fact there is some doubt in my mind whether intestinal amoebiasis is ever from the start a true dysentery like the bacillary type, and for that reason I prefer to allude to the disease as intestinal amoebiasis, a term introduced by Musgrave of Manila, to whom we owe a great debt for his careful work on this disease.

Intestinal amœbiasis is an infectious disease caused by the presence of amœbæ in the intestine. It is a disease of great irregularity in symptomatology and course. In its classical form it is characterized by abdominal pain and bloody flux. It is essentially a disease of the tropics, though it occurs in semi-tropical, and to a less extent in temperate countries. In the tropics it is endemic; in the temperate zone it is sporadic. The season of the year is an important factor in the prevalence of the disease. The onset of the rainy season is as a rule followed by an increase in morbidity. Sex is not necessarily a predisposing factor. Men lead a more active life and are less careful of their food and drink, especially when not at home, and are therefore more subject to the disease than women. It is reported⁵ that in Manila the ratio of infection in men and women is as 4.1 is to 1, but it must be borne in mind that in Manila there are more men than women in the foreign population. The women of the native population are not as accessible for medical examination as are the men, so that no conclusions can be drawn as to the prevalence in them. It is possible, however, that careful examinations of the native women would bring out the fact that infection is as common among them as among the native men, for they live much the same lives as do the men. Age is an unimportant factor except, as has been said before, that the more active members of the population suffer more frequently. Race too is unimportant, save perhaps for prognosis. The native contracts amœbiasis as readily as, and more constantly than, the foreigner, but in the native the disease is less severe and more amenable to treatment. In Siam, where the writer lived for two years, amœbiasis was apparently more common among the natives than among the foreigners. A careful examination of the stools of 50 persons in the Bangkok prison hospital showed that 22 per cent. harbored amœbæ.⁶ Later experience points to the possibility that this figure was a fair indication of the general condition. There are comparatively few cases of infection in the white population.

There are two important sources of infection, namely, unclean water and contaminated vegetables. Musgrave showed that lettuce was a probable source of infection, and that careful washing of the vegetable in several changes of distilled water did not suffice to remove all the parasites. Predisposing factors are general physical

condition and previous acute or chronic intestinal conditions, which not only modify the course of the disease but affect the prognosis.

Two forms of amoebae in the intestinal tract of man have been described: *Entamoeba coli* and *Entamoeba histolytica*. Schaudinn, Craig, and others have insisted upon the significance of these two forms, regarding the one, *E. coli*, as innocuous, the other, *E. histolytica*, as pathogenic. A recent communication of Werner⁷ gives a general critical survey of this matter and contains an excellent discussion of the pathogenicity and developmental cycles of the pathogenic amoebae. Without going into detail on the subject, I merely wish to state that the proofs for the difference in pathogenicity between these two organisms do not seem sufficiently well established to warrant a difference in treatment. I have seen cases of outspoken amoebiasis in which only protozoa of the *E. coli* type were present, and I have often seen both types in the same case. Moreover the habitats of both types in the outside world are the same. It seems possible that *E. coli*, if it be not actually pathogenic, may under circumstances, depending upon symbiosis with other organisms, be potentially so. The presence of amoebae in the stools of healthy persons seems to bear upon the subject of epidemiology exactly as does the presence of typhoid or dysentery bacilli in the stools of otherwise healthy persons. Until we know more of the pathogenic capabilities of the several forms of amoebae their hosts should be considered possible menaces.

The lesions of intestinal amoebiasis are as a rule confined to the large intestine, and usually involve the whole large bowel with the exception of the extreme lower end of the rectum. The following tabulation taken from a report on the pathology of intestinal amoebiasis published by Musgrave and the writer will give some idea of the varying localization of the lesion in certain groups of cases:

GROUP A (100 AUTOPSIES)

Cases that received unsystematic treatment or none at all.

	Cases.
Entire large bowel involved (except the extreme lower part of the rectum)	87
Lesions confined to the cæcum and ascending colon.....	5
Lesions confined to the transverse colon.....	1
Not recorded	7

Six of these cases showed involvement of the appendix, and two of the ileum.

GROUP B (100 AUTOPSIES)

Cases that were treated systematically by rectal injections

	Cases.
Entire lower bowel involved (except the extreme lower part of the rectum)	72
Cæcum and ascending colon	18
Descending colon, sigmoid, and rectum	9
Transverse colon	1

Of this series the appendix was involved in eight cases and the ileum in five.

The variation in the localization in these two series may be explained at least in part by the duration of the disease at the time of death, by the duration of treatment, and by the stage of the disease in which treatment was instituted. Systematic irrigation treatment reduces the number of lesions low in the bowel, but in many cases it has but little influence on those high up, unless the fluid is passed high enough and retained long enough so that peristalsis, which is often reverse in character, may assist the process. As a rule irrigations have no effect upon lesions in the appendix and ileum. It is, therefore, important to recognize the disease before these two areas are involved, and by thorough treatment prevent high infection.

There were, in the above series of 200 cases, twenty-five in which death resulted from intercurrent disease, and, so far as could be determined, early in the course of the amœbic process. In this series of twenty-five, there was a larger proportion of cases in which the lesions of amœbiasis were confined to a single segment of the bowel, and a smaller proportion in which they were general throughout the bowel.

GROUP C

	Cases.
Ulceration confined to the cæcum and ascending colon.....	11
Ulceration confined to the descending colon, sigmoid and rectum	8
Ulceration generally distributed in the large bowel.....	6

These figures point to early infection of the cæcum, and illustrate the necessity of *high* treatment. Neither the appendix nor ileum was involved in any of these cases.

The pathological appearance of the gut in the gross in tropical dysentery varies somewhat in different stages of the disease, depending upon the predominance of one of three types of ulceration or

upon the coincidence of all three. One form of lesion to which I have referred in a former paper is that called by Rogers the "small raised dots." These are minute areas of congestion or of capillary hemorrhage beneath the mucous membrane and frequently associated with superficial erosion. They are most numerous in acute cases. Occasionally erosions are found without congestion. In the stage of ulceration, two types of ulcer are found: the first, which I have called the "Harris type," is possibly a later stage of the hemorrhagic erosion, and is confined to the mucous membrane. "They generally reach into the submucosa and rarely to the circular muscle, but never deeper" (Harris). These ulcers are characterized by having a punched-out appearance, thickened and congested margins, and gray, edematous bases. They are situated at the tops of the folds of the mucous membrane and have a tendency to increase in the direction of the short axis of the bowel. They are less frequent in advanced cases than in subacute or acute. The second type is the classical undermined ulcer. The openings of these on the surface of the mucous membrane are often represented by small gray points with congested margins. Pressure in the neighborhood of these results in loosening a plug of mucus, and then it becomes evident that these gray points are the mouths of deep ulcers. Through these openings a probe may be inserted into large submucous cavities that undermine the mucosa in all directions. The superficial lesion is very circumscribed in the mucosa and it is only when the process has reached the submucosa that extension occurs. The muscularis mucosa and the circular and longitudinal muscle layers seem to possess a greater resistance than the submucosa to the amœbic process. For this reason extension takes place in all directions in the submucosa, and only at a later time are the muscular coats involved. Coincidentally the mucosa is thickened and edematous, and the muscular layers are infiltrated with small round cells. As a result of the confluence of the burrowing ulcers, small or large areas of mucosa may be separated and slough and so produce large irregular ulcers, the bases of which are formed by muscularis. As a further result of extension of the process into the muscular coats and peritoneum, necrosis may occur, followed by perforation and purulent peritonitis.

Healing takes place in small lesions by regeneration of the

epithelium and *restitutio ad integrum*, or, in the case of larger and more extensive ones, by the formation of scar tissue. A common result in cases of long standing is the establishment of a chronic catarrhal condition with atrophy of the mucosa and atony of the muscularis—a condition known as "sprue" or "psilosis." A general polypoid condition may be associated with this atrophy. In cases of well-marked sprue the walls of the bowel are of extreme thinness, the intestinal folds have disappeared to a large extent, and the total length of intestine is increased, sometimes by several feet.

Histologically the process is marked by œdema of all the coats of the bowel, by small-round-cell infiltration, and by the presence of amœbæ in the glands, in the submucosa, and in the lymph- and blood-vessels.

Dopter⁸ gives the following data to show the differences, in a general way, between bacillary and amœbic dysentery:

BACILLARY

1. In the early stages widespread catarrh with swelling of the mucosa, a few bacilli, and no amœbæ.
2. Progressive necrosis of the mucosa extensive. Submucosa thickened, œdematosus, and with a phlegmonous appearance. Many bacilli.
3. Broad superficial ulcerations affecting only the mucosa. Edges irregular, flat bases with purulent infiltration. Bacilli numerous.
4. Ulceration reaches the deeper layers only in severe cases. Rarely undermined.
5. The process is an acute inflammatory one.

AMœBIC

1. In the early stages localized catarrh with amœbæ but no dysentery bacilli.
2. Localized necrosis reaching into the depths of the tissues. In the submucosa amœbæ-containing abscess cavities.
3. "Collar-button-shaped" amœbæ-containing ulcers with overhanging edges, in submucosa.
4. Ulcerations commonly undermined and commonly reach to the muscular layers.
5. The process is a subacute or chronic inflammatory one.

The symptoms of intestinal amœbiasis are extremely variable. As a rule, perhaps, especially in mild cases, the early symptoms are overlooked. A slight morning diarrhœa or alternating diarrhœa and constipation, with indefinite abdominal uneasiness or slight pain, especially at night, may be the only symptoms. In other

cases the diarrhoea is more constant though it may not be troublesome. There may at times be a trace of blood. Upon this symptom Martini⁹ puts some emphasis. I think it of less importance than the alternating diarrhoea and constipation with indefinite abdominal uneasiness. These two symptoms occurring together are very valuable diagnostic points. In another series of cases the symptoms are those of a severe diarrhoea with much mucus and occasionally macroscopic blood. In still another class there is typical bloody flux, though it is never, at least in uncomplicated cases, as severe as in the bacillary type. I believe it safe to say that, as a rule, mucosanguineous stools belong to a late stage of the disease or to an unusually acute form, and that dysenteric symptoms with much tenesmus occur only in the late stages or they are the result of a secondary infection.

The diagnosis depends upon the recognition of motile amœbæ in the stools. Specimens are best obtained after a saline cathartic.

Treatment depends entirely upon local applications. The methods of such treatment are numerous and the substances recommended are legion. It is easy to treat the lower bowel by means of solutions introduced *per rectum*. In some cases it is comparatively easy to introduce the fluid as high as the cæcum. It is, however, impossible to treat the appendix, and when this organ and the cæcum are involved, Tuttle's method of appendicostomy is the simplest and the most efficient. Medication by mouth is usually unsatisfactory and often harmful. In cases where there is tenesmus, an ounce of Rochelle salt and an ounce of paregoric in a glass of water sipped at intervals over a period of several hours, is often of great service in emptying and soothing the bowel, and in so preparing it for local treatment. In other cases small broken doses of calomel are as useful as in any other intestinal infection, and are often of additional value in ridding the bowel of flagellates, which are frequently numerous.

Of the various medicaments that are of service in preparing enemata the most valuable are the salts of quinine, thymol, methylene blue, and alphazone. All of these are as a rule used in aqueous 1:1000 solutions. It is, however, wise to commence the treatments with milder solutions and gradually increase the strength. In this fashion the quinine solutions may be begun at 1:5000 and increased to 1:750 or even 1:500. Thymol in solu-

tions of 1:2500 is usually sufficiently strong, though one may use 1:1000. The thymol may be kept in a stock solution by dissolving a certain amount in absolute alcohol and then adding pure glycerin to the desired amount. I have found that methylene blue may be used to advantage by combining it in the proportion of 1:1000 with the quinine solution. Alphazone may be used in a strength of 1:1000. It is sometimes useful to alternate with quinine and thymol. Various drugs have been recommended for use by mouth. The usefulness of these must be limited because of the general uncertainty of all of the so-called intestinal antiseptics. Benefit is often derived from the use of some of these in conjunction with the treatment by enemata. The ipecac treatment is warmly recommended by some writers of very wide experience. Musgrave and Strong have found no value in it. The Epsom-salt treatment as a routine seems logically bad, but Epsom or Rochelle salt used in connection with enemata are both of value. The method with which I have had best results is that described by Musgrave in the *Philippine Journal of Science*.

The prognosis is, as a rule, good in early, uncomplicated cases. Neglected cases and those that have become chronic are often extremely obstinate.

Complications are hepatic, cerebral, and pulmonary abscess, peritonitis, and intestinal hemorrhage. The first is by far the most frequent, occurring in from 11 to 33 per cent. of the cases. Musgrave has observed two cases of general infection with amœbæ. Hepatic abscess is less frequent when careful systematic treatment is commenced early.

Prophylaxis is accomplished by the use of clean water and food. In regions where there is danger of infection the water should be boiled, and none but cooked food eaten. Especial care should be taken in places where gardens are manured with human refuse. Martini⁶ insists that all sewage should be sterilized and protected from flies, which may act as carriers. Some emphasis has been laid on this latter point by Werner,⁷ who has observed that the vegetative forms of amœbæ may be ingested by the common housefly, that in the body of the fly they become cystic, and that later these cysts are expelled from the alimentary tract of the flies and again become active. Werner was able to cultivate the amœbæ from the dejecta of infected flies.

DYSENTERIES THAT OCCUR AS SYMPTOMS OF INFECTIONS
WITH ANIMAL PARASITES

Opisthorcus sinensis is a trematode parasite common in Japan, China, and the Philippine Islands. Garrison¹⁰ has reported its occurrence in Manila in 0.3 per cent. of 3447 cases harboring parasites. It occurs in other parts of the world to a less extent. The writer has reported cases infected with this parasite from Siam. But 20 cases have been reported in the United States. It is probable, as Stiles¹¹ says, that man, cats, and dogs are its normal hosts. It inhabits the bile-ducts and has been found in the gall-bladder, pancreas, duodenum, and stomach. Infection probably occurs by way of drinking water. The principal symptoms are enlargement and tenderness of the liver, and diarrhoea, which is at first irregular but which becomes more severe until, after from two to five years, it is dysenteric. In late stages of the disease the stools are muco-sanguineous.

The diagnosis rests upon the demonstration of the characteristic ova in the stools.

Treatment is unavailing. The prognosis is bad.

Prophylaxis depends upon a pure water-supply, and one that is protected from contamination by man, dogs, and cats.

Paragonimus westermanni, the cause of parasitic haemoptysis, is also a common parasite in Japan, China, and the Philippine Islands. Musgrave¹² has reported seventeen cases with eight autopsies in Manila, and Garrison¹⁰ found this fluke in 0.4 per cent. of his 3447 cases. A similar parasite is the cause of an endemic disease in hogs in the United States (Stiles).¹¹ The chief symptoms of infection are referred to the lungs, and consist of cough and expectoration of rusty or red material. The single characteristic of the disease is the presence of ova in the sputum. Less commonly than the lungs, the liver, brain, eyelid, mesentery, omentum, and intestine may be affected. The presence of eggs in the intestinal wall results in ulceration and in the passage of mucopurulent and mucosanguineous stools. The diagnosis of the intestinal complication depends upon finding the ova in the faeces.

Treatment is useless. Spontaneous cure sometimes occurs.

Prophylactic measures should consist in securing uncontaminated water and food. Animals that harbor the parasite should

be destroyed. Sputum containing eggs should be thoroughly disinfected.

Fasciolopsis buski is almost exclusively a parasite of Asia. It has been reported but once in the United States. Unlike the other flukes it is the cause of a primary intestinal infection of which the symptoms are nausea, vomiting, indigestion, and bloody diarrhoea. The life history and the source of infection are not known.

Treatment with thymol and calomel is said to be of value in causing expulsion of the worms.

Schistosoma haematum and *Schistosoma japonicum*.—The former, though most frequently found in Africa, has also been reported from Panama, Cuba, Porto Rico, and other parts of the world; the latter is an oriental parasite and is most frequently encountered in Japan. It occurs also in China and the Philippine Islands. Both of them inhabit the blood-vessels. The young worms are found in the veins of the liver, the portal vein, and the veins of the urinary bladder walls. The ova, which wander from the lumina of the vessels into the tissues and into the cavities of the intestine and bladder, are the cause of the symptoms. These ova are passed in the faeces or urine and infect the water-supply. They contain ciliated embryos which are released soon after the ova are passed, and these embryos are capable of causing direct infection of the alimentary tract either by way of the mouth, or, as some investigators believe, by way of the rectum or urethra.

The disease schistosomiasis is a chronic disease. Symptoms are dependent upon the localization of the ova. When the urogenital tract is affected, haematuria and cystitis are frequent. When the bowel is affected, the prominent symptoms are bloody diarrhoea or dysentery. The Egyptian fluke is most commonly associated with the urogenital type; the Japanese variety with the intestinal. The extensive and complete reports of Katsurada¹³ and Tsuchiya¹⁴ state that the important symptoms of infection with the Japanese fluke are splenic and hepatic enlargement, anaemia, ascites, and diarrhoea, the latter often of the mucosanguineous type. My case, the first reported from the Philippine Islands,¹⁵ showed hepatic and splenic enlargement, anaemia, and diarrhoea.

Diagnosis is based upon the finding of the ova in the faeces. These ova may be confused with those of *Uncinaria*. The presence of a ciliated embryo within the eggs will differentiate the two.

Unlike the ova of *Schistosoma haematobium*, those of *Schistosoma japonicum* have no spines.

The presence of schistosomiasis in Japan suggests that there is some possibility that it may be imported sometime into California and other localities where there are Japanese settlements.

But the Japanese settlements are not the only source of danger. One must bear in mind the possibility of bilharziasis in soldiers returning from foreign services, in transient foreigners from infected districts in other countries, and, perhaps most important of all, in natives of foreign countries who take part in international expositions. I am indebted to Dr. H. B. Ward, of the University of Nebraska, for a list of imported cases in the United States and Canada. I shall not give this in detail but shall simply epitomize it and state that *Schistosoma haematobium* has been found in twenty cases, all of whom were transient foreigners, or soldiers returned from foreign services. These observations were reported from Chicago, New York, Philadelphia, St. Louis, Detroit, Florida, Georgia, and Canada. However, if the theory of infection with these parasites, as recently promulgated by Loos,¹⁶ is true, then the danger of infection in America is less than it is in tropical countries. Loos believes that infection with *Schistosoma haematobium* takes place by way of the skin by means of the ciliated embryos which are present in contaminated puddles of water, and that this is the only means of infection that satisfactorily explains the distribution of schistosomiasis in the natives of Egypt. If this is true of *Schistosoma haematobium*, it is also probably true for *Schistosoma japonicum*. The latter parasite is also very prevalent in cats and dogs, so that those animals may reasonably be distributors of the ova and form an important source of contamination of water. But cutaneous infection in cats would probably not be the rule, for cats are not naturally water lovers. It seems to me, therefore, that we must consider the importance of infection by mouth at least in the case of the Japanese parasite.

Flagellate Dysentery.—This form of diarrhoea or dysentery has been attributed to the presence in the intestinal tract of certain flagellates, notably *Trichomonas intestinalis*. A review of the literature on *Trichomonas* infections up to January, 1908, has been published by Freund.¹⁷ Freund's discussion of his own cases and those in the literature is interesting, but to one who has seen hun-

dreds of cases, each harboring innumerable parasites of this sort, it is unconvincing. It is certainly true that the presence of these organisms is very often associated with diarrhoea or even dysentery, but it is rare that one is justified in referring the symptoms to them. It is also true that if one uses medication that destroys or reduces the number of the flagellates, the symptoms are very often abated or removed. This again is no absolute indication that the symptoms were referable to the trichomonads. As a matter of fact, the monads are an evidence of the use of impure water or food, and very often other agents have led to the production of intra-intestinal conditions that are favorable to the life of the flagellates. The most that we are justified in saying at the present time is that monads are frequently found in the faeces; that as a rule they are secondary invaders; and that it is possible that they may act as foreign bodies and exert an irritant action on an already diseased mucous membrane. The fact remains that for one case that shows an association of flagellates and intestinal symptoms, there are thousands that show no such association. Nevertheless Werner,⁷ Billet and Chassin, and Troussaint and Simonini,¹⁸ report cases in which the symptoms, and possibly death, are referred to the presence of trichomonads. With Dr. Dunn, in Omaha, I have seen a patient who for months harbored trichomonads in her bowel. Up to the present time I have not been able to demonstrate any definite relation of pathological changes to the monads. In an experience of six years in the tropics I have never been able to demonstrate the presence of monads in any close association with lesions of the intestinal tract. It seems more logical to believe that, given a primary abnormality, say a catarrhal inflammation, the monads may hinder recovery, and that with the disappearance of the monads, recovery occurs more rapidly than it would in their presence. It must, however, be remembered that nearly any treatment that will cause the disappearance of the monads will also tend to act upon other organisms or micro-organisms that are possibly the primary cause of intestinal changes. This is especially true of calomel, which is the most active drug we have found for clearing the bowel of flagellates.

These cases remind one of Dodieu's three cases of dysentery associated with *taenia*.¹⁹ After expulsion of the worms improvement was rapid.

The presence of monads in the stools is important in that it calls attention to the fact that the water-supply is not a good one, and that the hygienic surroundings or habits, or both, are bad. When these protozoa are encountered in examinations of stools, one must consider the possibility that other more dangerous parasites, a part of whose life cycle is spent in water, may also be present.

Infusorial Diarrhoea.—Diarrhoea or dysentery may be associated with the presence of *Balantidium coli* and *B. giganteum*. Of these, so far as we know, *Balantidium coli* is the only one of pathological importance. It has been observed in many cases of intestinal disorders. Strong³⁰ says that "whether the *Balantidium coli* is capable of producing a primary lesion in the intestines or not has not been conclusively demonstrated. However, if such an erosion of the mucosa exists from any cause, the parasite is certainly capable of continuing the process and of modifying it and producing, in connection with the bacteria which accompany it, more or less characteristic pathological lesions." There is every reason to believe that Strong's position in this matter is the right one. Through his kindness I have been able to examine his specimens and am convinced that the *Balantidium coli* bears the relation to the tissues which he suggests.

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